TMF

November 1988

THE MAC FLYER-For Greater Safety in MAC Air Operations

TWENTY SECOND AIR FORCE

Twenty-Second Air Force . . . page 16

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November 1988 MACSP 127-5 VOL XXXV NO. 11

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General Duane H. Cassidy

CINCMAC Praises Record Year

Congratulations on a great flying year!

For the first time in airlift history, MAC active duty and associate units flew the entire fiscal year without a chargeable Class A or Class B flight mishap. We logged over 675,000 hours without one destroyed aircraft or crewmember fatality--that's great--that's professionalism at its finest!

MAC has a complex and demanding mission. We fly wherever we're needed, day or night, frequently at low-level, and in the harshest environments around the world.

In our business, the flying business, we must never become complacent. You should, however, be very proud of this outstanding performance. We're very very good, but not perfect. Therefore, I encourage you to fly every sortie with the same professional, disciplined approach that resulted in this fine record. Well Done!

Maj. Gen. Alexander K. Davidson

22 AF COMMANDER . . . ON SAFETY

Over the years we've made tremendous strides in our safety programs. That's been manifested in the dramatic decrease in our major mishap rate. In 1947, for example, the year our modern Air Force was chartered as a separate service, the aircraft accident rate was a sobering 44 losses per 100,000 flight hours. By 1967, our 20th birthday, the rate had dropped to 2.3. Last year when we reached our 40th birthday, the rate had decreased even further to 1.65 and MAC's rate was less than half of that. The current year has been even better, with an Air Force rate of approximately 1.6 and MAC having a perfect record or zero rate through for FY '88.

How did all that happen? Just by stressing safety to our flyers? No, it involved a lot more than that. We could cite literally hundreds of factors, but there are a few that are the big drivers. Perhaps the greatest changes have been in the aircraft we fly. Advances in aviation technology have steadily improved the reliability of virtually every part of the aircraft. The jet engine, notwithstanding some rough beginnings, has produced quantum increases in power available and in the dependability of that power. We've learned much about structures and aerodynamics, some of it the hard way, and we now take for granted a strong and durable airframe with good performance and fully predictable handling qualities. And progress hasn't slowed down; it's actually accelerating at an increasing rate. Today, we're in the midst of a literal explosion of technology in solid-state avionics and microelectronics, in new composite materials for airframes, in all aspects of propulsion technology, in aerodynamics and flight controls, and in many other areas all of which are helping produce a safer flying machine.

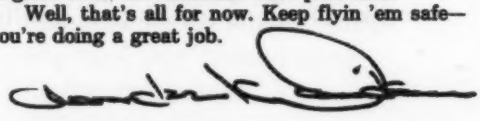
We've also made great strides in our training and in our operating procedures. As with the hardware, we learned from our mistakes and incorporated lessons learned from many sources. Our modern simulators and other training devices have been major contributors to taking much of the mystery and the hazard out of the training process.

It's easy to see that we've come a long, long way in reducing or eliminating many, if not most, of the mishap factors that we can assign to the equipment, our training methods, operating procedures, and support systems. All that being true, some might say we could reasonably expect to see major mishaps virtually disappear. Well, that hasn't quite happened, has it? Flying safety is like a lot of other things: as we get closer to perfection or zero mishaps, the last few percentage points become increasingly more difficult to achieve. Stated another way, we've worked hard and very successfully to eliminate all the easy ones, and now we're faced with that small remainder of mishaps that often seem to defy all logic . . . and often involve human factors.

Mishaps that fall in this category don't yield easily to the normal pre-emptive or preventive measures. Accordingly, we need to direct our best thinking toward how to attack the problem. My own personal approach has always been to try to focus on a few basic truths that help keep things in their proper perspective. One of the best and most succinct expressions of this I've ever heard came from a civilian flight instructor I've had the pleasure of flying with numerous times over the years. His philosophy started with: "Don't do nuthin' dumb in the airplane." Not grammatical, you say—not polished! Maybe not, but certainly not hard to understand either, and right on target. This cryptic admonishment covers a lot of ground. It means not pushing weather or airplane limits when you don't need to. It means not taking risks that would perhaps be appropriate in wartime, but clearly not in a peacetime training situation. It means not showboating just because you think you can get away with it or because your ego needs a boost.

That same aviator also had a few other favorite maxims he felt had always stood him in good stead. He put it very tersely: "There's a few things in this flying game that, if you keep firmly in mind, can save you a whole lot of trouble. . . . Always watch your airspeed and if the airplane talks to you, listen! " Sounds elementary, but, of course, what the old instructor means is, know and use the right airspeed for what it is you're doing—be it a takeoff, an approach, a landing, or any other maneuver. And if, for some reason, you find yourself going too fast or too slow, the flying machine normally will give you some advance warning—learn to sense and recognize those warnings; sometimes they're very subtle, but they're always there and they can save your bacon or even your life every bit as effectively and probably more reliably than mechanized warning devices or rote procedures. . . . "If you intend to land the aircraft, be sure you've got some kind of rollers under it." . . . You wouldn't think *anybody* would ever forget that one, but it still happens. The final element of his philosophy and a very good one for all of us is . . . "Have an abiding curiosity about where you are and where the ground is ." . . . That advice is just as pertinent in today's world as it was yesterday. Our modern high technology navigation systems, ground mapping radars, and improved approach aids can easily create a false sense of security. Maintaining a strong basic awareness of what's going on coupled with that good ole' common sense will do you a world of good when the machines have problems.

Well, that's all for now. Keep flyin 'em safe—you're doing a great job.



Reflections at Dusk

Memories at the end of the road.

By MSgt. Larry E. Koewing
3 MAS, Dover AFB, Delaware

"Thanks, Sergeant Boone. I appreciate the training, not to mention the helpful hints that make things easier," the student engineer said, smiling.

"Well, Bob, I've enjoyed flying with you. I'm sure, with your ability and attitude, you'll have no trouble upgrading," his instructor, MSgt. Tom Boone, replied. "Just watch out for the paperwork distracting you from minding the store."

"I will, Sergeant Boone, and thanks again."

"See you, Bob."

Although his student didn't seem aware of it, this was Tom's last flight as an Air Force instructor flight engineer. He leaned back in his chair and surveyed the walls of his domain—the squadron engineer training office—as if seeing it for the first time. The charts of students' progress, the "hot board" with important items, the large "Z" clock . . . all the things he'd looked at who knows how many times. Yet now he was staring intently, as if to memorize each thing.

Sergeant Boone enjoyed a reputation among all squadron crewmembers for being a thorough instructor and professional flyer in the best sense of the terms. He taught students not only what was required, but asked thought-provoking questions leading students to a deeper understanding of systems and performance. Many called him a "flight engineer's flight engineer," and they weren't far off the mark.

In the stillness of the weekend evening, he picked up his cup of hot coffee and inhaled the aroma. "Mmmm," he muttered. "This stuff must be imported from the Navy." He squinted through the hot vapor at the FE board under the bluish fluorescent lights. Above the board was the logo, "Top EPR Artists," put there by one of the section wags. Tom's gaze wandered across the board. Many of the names belonged to engineers who'd been his students at one time or another. "Top EPR Artists," said Tom thoughtfully. He wished he could count the times he and others tried to figure out what made a good flight engineer. Sipping the coffee, he reflected back on some of the students he'd flown with. Maybe there was a common thread leading to success.

Honorable Mention 1988 MAC Flight Safety Writing Contest

There was TSgt. Robert Probst. Rob, as he liked to be called, had come from a fighter maintenance unit. He wasn't extremely knowledgeable about the big transport flown by this wing, but what he may have lacked in knowledge was compensated by organization. From the start of crew briefing to billeting at the next station, Rob was a master of organization. Even the most difficult home station departure was conducted with awesome smoothness. This would extend throughout the flight. Pilots really liked flying with Rob. He seemed to have a sixth sense for anticipating situations and having good, solid recommendations for dealing with them. No matter what—an emergency, maintenance trouble, or billeting problem—Rob was always on top.

Tom's eyes next fell on the tag labeled Benson. SSgt. John Benson had come from the flightline OMS branch. He was known through the grapevine as a pretty good crew chief. Everyone thought his knowledge of the airplane would make his upgrade a snap. Some snap, mused Tom. He recalled the difficulties occurred during John's upgrade. Though competent enough about aircraft systems, John had an unpleasant tendency to substitute technique for procedure. "Sipping coffee. That's when it happened," Tom muttered aloud. They'd taken off at dusk on a trip to Europe and had just reached cruise altitude. Shortly afterwards, a "generator-out" light came on. As Tom watched, John ran the proper procedure of checking the generator and, seeing normal indications, turned it back on. The light promptly illuminated once again. "Well, John, that's all for that one," he'd said. "Let's turn it off and leave it off. We have three good generators on the other engines, so we're still in good shape." After advising the aircraft commander of the situation, Tom asked if anyone would like anything from the galley. The pilots and student engineer passed. The instructor went back, got a cup of coffee, and returned. After he strapped back into the IFE seat, he sipped a little of his drink and began a complete panel scan—a long established habit. Just as he noticed the errant generator back on, the electrical system portion of the FE panel was a momentary blaze of flashing lights. The bad

". . . his student was doing things differently, substituting for prescribed procedures."

generator had knocked the three good generators off the line. But for some unknown (yet fortunate) reason, it stayed on and assumed the airplane's electrical load. After things were sorted out and the excitement died down a bit, Tom asked his student why he had turned a known bad generator back on, in violation of Section III procedure. John said he'd checked it again and all indications were good, so there apparently was no longer a problem. Tom was flabbergasted. Although John's second engineer qualification allowed him to sit at the FE station unsupervised at cruise, Tom stayed with him anytime he performed crew duties. Tom also noted his student was doing things differently, substituting for prescribed procedures. The mission debrief with squadron supervisors hadn't been pleasant. John was defensive and combative. He felt his maintenance background allowed him to develop and use his personal techniques and substitute them for required procedures. Sergeant Benson was finally made to realize that operations and maintenance operate the aircraft under different sets of rules, each for their own valid reasons. Although John had upgraded, Tom still heard an occasional rumor about Sergeant Benson's "doings"—things that made you wonder.

Wonder. Now there's a name and a tale, thought Tom. Sam Wonder (that *was* his real name!) had been his sharpest student. If Sam had a weakness, it was his desire to be the best. That in itself was not bad, but what went with it was. Sam was the epitome of everything a flight engineer should be—conscientious, knowledgeable, sharp. All those terms came to mind when he thought of Sam. In fact, he couldn't think of a single error Sam had made during his upgrade. The talk around the squadron was that Sam lived, breathed, and read nothing but flying. The trouble was Sam also expected everyone else to live up to his almost superhuman standards. Further, he wasn't shy about letting folks know they fell short of his expectations. He extended this not only to engineers, but pilots and loadmasters as well. More than one had fallen victim to his acid comments. Tom leaned forward in his chair. Well, he thought, the old saying of "what goes around comes around" proved true in Sam's case. Chief Parsons, the wing chief engineer, joined Sam for an overseas channel mission briefing. He announced he was going along to administer no-notice evaluations. Sam had recently upgraded to first engineer and was supremely confident of

his abilities. Later, though, Sergeant Wonder found he had more than met his match in the Chief. Without breaking his spirit, the Chief had gently humbled Sam. When asked about it, the Chief would only say Sam had learned a couple of things. As for Sam, he seemed to make a complete turnaround. He changed into one of the most helpful people one could know and was a ringer for early instructor upgrade.

All these different names, different missions, combinations of people and personalities, knowledge levels, and circumstances flashed through Tom's mind. He glanced away from the board and caught the name Maloney under the red "Ops Hold" tag. Timothy Maloney had come to the squadron from another strat airlift wing. He'd been at that wing's training office and had done quite well. Tim had been involved in some major programs, and played a key role in their successes. He'd been promoted to Master Sergeant with just over 12 years' service. Yet, he'd not adapted well to being a student again on a new airplane. He treated the training program with barely concealed disdain and flouted the rules. He made it clear this was just a way station en route to bigger and better things. It all caught up with him on his checkride, though. Tim thought he could squeak by, relying on his previous flying ability. It didn't work. Tom remembered seeing Tim getting off the crew bus a couple of days ago. He'd looked tired and dejected. When setting up his remedial training program, Tom talked with the examiner who'd administered the checkride. Tim had given the pilots incorrect wind data in windshear conditions. Had the examiner not caught the error, the landing could have been catastrophic. Tim's knowledge of limitations was sketchy at best, and he wasn't able to go through most of the bold face without error. Tom wasn't sure what the future held for Sergeant Maloney. His attitude would make all the difference, one way or the other.

Draining his cup, the instructor thought, now that's probably it. Attitude. Attitude toward crew position, toward other crewmembers. Attitude toward the study needed to maintain proper knowledge level. Attitude toward flying locals. Everyone knows they're not fun, but in these times of fewer line missions, they can be a big boost to maintaining hands-on proficiency. Attitude toward the flying profession—a profession for which we all volunteered. And attitude toward our role as NCOs and, ultimately, combat personnel.

That's a good way to finish, he reflected, just as the telephone rang. Picking it up and answering it, he heard his wife's voice asking how it went, and how soon he'd be leaving for home. "Right now, honey. See you in a few. Bye." He put down the phone, picked up his book bag and left without looking back. As he rounded the hall corner to go out the door, he was surprised to see a large group of people there, all squadron members and their spouses.

"Sergeant Boone," said the squadron commander. "We may have missed you at the aircraft but we didn't miss you here. Since this was your final flight we couldn't let it go unnoticed."

With that he waved someone forward with an old fashioned pump style fire extinguisher the squadron kept for just such occasions. Before Tom could move or speak he was doused with a couple of quick squirts. Blinking through the water running down his face, he said, "What's all this? I thought I was going out quietly."

"None of that stuff," laughed a voice he recognized as belonging to Rob. "Our premier instructor must be sent into retirement properly."

His wife walked over to him and took his arm, as the squadron commander pumped his hand. Looking at his wife, Tom exclaimed, "But you're home, you just called me from there!"

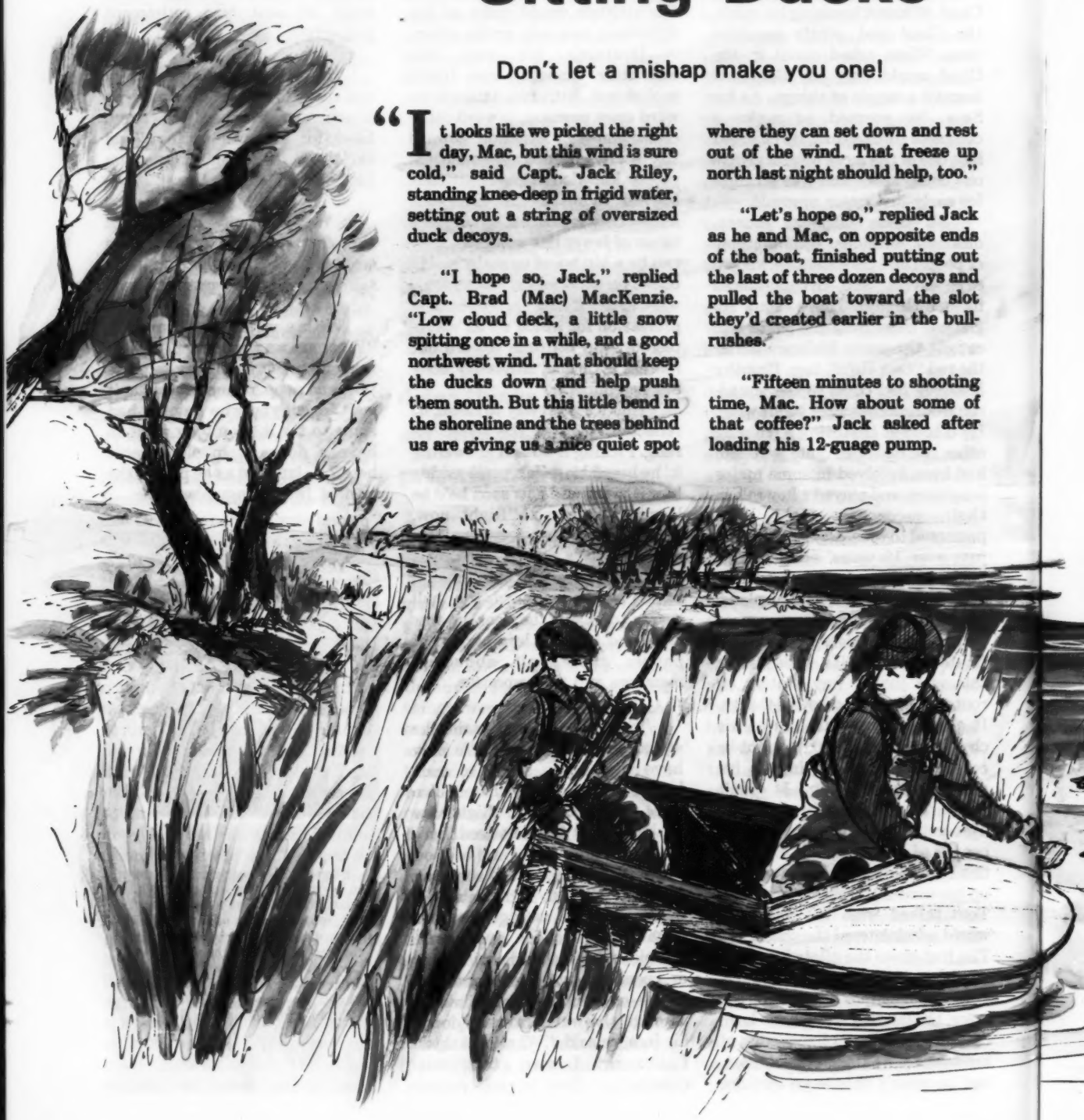
"Well, not quite. Rather from the commander's office," she smiled. "We thought you were taking a long time getting here."

With a wide grin, Tom said, "What are we waiting for? I know my wife has brought my favorite jalapeno pepper sauce and I can't wait for all you who haven't had some to try it. You may want to have a douse from old reliable here," he laughed as he patted the ancient fire extinguisher.

Sergeant Koewing began his flight career in 1979. He has over 2600 hours in the C-5. Prior to assuming his present position as Dover AFB Flight Engineer Course Monitor for the new United Airlines Services Corporation C-5 Aircrew Systems Contract, he was Chief Instructor Flight Engineer for Dover's 3d Military Airlift Squadron.

Sitting Ducks

Don't let a mishap make you one!



"It looks like we picked the right day, Mac, but this wind is sure cold," said Capt. Jack Riley, standing knee-deep in frigid water, setting out a string of oversized duck decoys.

"I hope so, Jack," replied Capt. Brad (Mac) MacKenzie. "Low cloud deck, a little snow spitting once in a while, and a good northwest wind. That should keep the ducks down and help push them south. But this little bend in the shoreline and the trees behind us are giving us a nice quiet spot where they can set down and rest out of the wind. That freeze up north last night should help, too."

"Let's hope so," replied Jack as he and Mac, on opposite ends of the boat, finished putting out the last of three dozen decoys and pulled the boat toward the slot they'd created earlier in the bull-rushes.

"Fifteen minutes to shooting time, Mac. How about some of that coffee?" Jack asked after loading his 12-guage pump.

"Good idea. Hey, how was safety school? I haven't had a chance to talk to you about that."

"Great. I learned a *lot* about investigating, but very little on the more mundane aspects of being a safety officer," said Jack.

"Well, a lot of that will be learned on the job. Don't forget, your main purpose isn't investigating big mishaps. Heck, most guys never do even one. Your biggest job is motivation; getting people to think about what they're doing and whether it's being done safely or, when flying an airplane, is it better to go around and try again."

"And I suppose you have some examples to prove your point," said Jack with a resigned sigh.

"Well, yeah," replied Mac with a Cheshire grin, "unfortunately the folks in the field provide us plenty of fodder for discussion. Besides, we're already 15 minutes into legal shooting time without a duck in sight. Looks like we'll have to wait a while for the wind to blow some our way, so here's one example.

"It's one of those sad-funny stories. No great damage, but evidently somebody was in a hurry and skipped one little detail. A C-141 departed a non-MAC base and passing 5,000 feet the loadmaster heard a loud bang under the airplane. After turning around and lowering the gear, they found they'd left the scanner cord wrapped around the nose strut. They lost the connector on the end of the cord."

"How could anybody miss such a normal, everyday thing like that?"

"As I said, in a hurry and not making a complete check before boarding. Who knows? But we let things happen when we're confronted by the out of the ordinary, too. One of our two-holers proved that recently. The crew received vectors to a visual approach to a runway undergoing construction on the first 1,000 feet of the approach end. That meant the first 2,000 feet were closed, leaving 6,000 usable feet for landing. A displaced threshold was marked with normal displaced threshold arrows, green threshold lights, and additional fluorescent yellow nylon chevrons on the closed portion. The copilot was flying, and the AC was in the right seat. He flew a normal visual approach backing it up with TACAN. Tower advised them during rollout that they'd landed directly on the barrier cable located on the displaced threshold. The airplane was inspected and found okay, but the airfield manager found one of the nylon chevrons torn. Turns out they'd actually landed 28 feet short on the closed portion of the runway.

"It looks like the copilot selected an aimpoint based on the full length of the runway. This placed the airplane below a normal visual glidepath for the displaced threshold, resulting in a low, flat approach. At about 100 feet above touchdown, the copilot placed the throttles to idle, contributing to the short touchdown. The AC didn't attempt a go-around because he believed the airplane was going to touch down anyway—apparently beyond the threshold."

"Looks like he made a couple of erroneous assumptions," stated Jack.

"Maybe, but the main point is this. We have two pilots who knew of the shortened runway from the IFR Supplement, NOTAMS, ATIS, and the tower, and still landed short! There are some bases and airports with permanent displaced thresholds, Norfolk Naval for example, and we get used to coping with them routinely. But here was an out of the ordinary situation at a runway these guys had probably seen many times before, and it appears at least one of them stuck with habit patterns when landing that day. A last minute reminder from the AC about the shortened runway and adjusting the aimpoint along with some extra caution might have prevented a lot of embarrassment.

"It's like defensive driving. You don't wait for the other guy to do something before reacting; you anticipate a wrong move and have a plan for dealing with it. In this case the other guy is only a few inches away, and you can talk to him and discuss the hazards of the situation and how he's going to deal with them. I guess it comes back to crew coordination and communication, two of the most important but most difficult things to perfect."

"I guess you're right. You can sure wing some big lessons out of some little mishaps. Nobody's even gotten a scratch so far," commented Jack. "But, back to the reason we're here. Where are all the ducks? This looked like a great day. I hope that coffee's still hot. It's getting colder than a brass monkey's behind out here."

"Well, it's a long way from those big lakes up north. We'll get some action yet," assured Mac, "but what you said about nobody getting hurt in these mishaps is important because we can learn some good lessons without looking at a smoking hole. They're cheap, especially for the folks involved."

"You're right there. Wait a minute—maybe—nope, they're headin' south with the wind. Looked like canvasback, too. At least we're seeing a few now."

"Our little pocket of calm will bring some in yet," reassured Mac. "There was one more instance I'll mention and then I'll shut up. Seems there was a C-5 crew, recently, that learned good lessons in crew coordination, checklist discipline, and situational awareness, all because of a relatively minor emergency.

"About 15 minutes before landing on the last leg of a mission, the FE reported Number 4 engine top hydraulic pump pressure low light was on. Of course, he depressurized the pump, which was followed shortly by loss of hydraulic system quantity. The AC called for the loss of hydraulic quantity checklist, engine scan, declared an emergency, and landed.

"The first pilot was in the left seat, so he cleared the runway and stopped on the parallel. The scanner and FE deplaned to scan the engine and the FE recommended shutting down the engine because of an apparent leak in the area of the P and D valve. Of course, the AC directed the 'Loss of Fluids' checklist.

"Now you're not a C-5 guy, but that checklist is run only on the ground and calls for evacuation as the next to last step. Well, in this case the AC did shut down Number 4 engine, the leak stopped, and he decided to continue taxiing to parking. Number 4 hydraulic system is the 'normal' power source for the brakes. The 'Loss of Fluids' checklist calls for brakes switched to 'Emergency' before shutting down any engines."

"Oops, I think I know what's comin'."

"Looks like you guessed it. While taxiing to parking, the first pilot made three applications with emergency brakes and, as advertised, that was it for the brakes. As the airplane approached the parking spot, he noted and reported brake failure. The AC interpreted this as total brake failure, since he was under the impression the brake switch was still in 'Alternate Brakes', where it would have been when they landed.

"As a result of his false impression, the AC selected max reverse thrust allowed by the thrust reverse limiter on Numbers 2 and 3. This had little effect, even though the airplane was pretty light. After over 20 seconds of max reverse, they selected 'Alternate Brakes' and stopped the airplane."

"Heck, doesn't sound like any great damage done; only a few puckered seat cushions."

"Not quite, Jack. There's usually a cost for any mistake dealing with airplanes, and this was no exception. Seems there was some damage to Number 3 engine caused by rivets which were drilled out and replaced in the engine inlet cowling. The T.O. doesn't specify removal of drilled-out rivets. They're allowed to fall into and remain in the inner cowling; and this source of FOD caused 35 rivet size knicks in second stage fan blades and sheet metal damage to the blocker doors."

"No way they could have foreseen that."

"No, and in fact a resultant T.O. change will prevent it happening again, but any situation, on the ground or in the air, calls for the same basic guidance. Maintain aircraft control, analyze the situation, and take proper corrective action. The Dash One doesn't cover every contingency. You have to have a solid knowledge of your airplane, general aircraft procedures, and follow the checklist. In this case, the AC should have finished the checklist, and if he wasn't going to evacuate and shutdown, realized he was sitting in an airplane that would normally be cranked up from the 'beginning.' He should have run through the appropriate checklists before continuing taxi. You have to be aware of the total situation."

"Well, the situation here doesn't look too good, either."

"Don't bet on it," Mac whispered. "Here they come, low along the water from the left, stay down. They're swinging right, getting into the wind, about 20 bluebills."

"Right, I got 'em."

"Ready, let's take 'em. Now!"

Excellence in Airmanship

Maj. Oral W. Carper and Crew, 305 ARRS, Selfridge ANG Base, Michigan, had just completed a normal onload and takeoff. Major Carper, AC, called for gear up and as the gear retracted the crew heard a loud, though muffled, double popping sound. Power on all four engines of their HC-130N aircraft dropped from 16,000- to 10,000-inch pounds torque. Power climbed back to about 15,000 before dropping once again and stabilizing at 11,000-inch pounds. Believing it to be an electrical problem, Major Carper directed the FE, MSgt. Henry G. Palma, to turn off generator Number 2, and ensure the remaining generators take up the load. Despite this action, the engines didn't regain normal power. Suddenly, the aircraft experienced severe vibrations. Number 3's torque reading was high, off scale. Oil and gear box oil pressure gauges were spinning. Unable to maintain level flight, the Major Carper began a slow turn back to the field as the aircraft continued a shallow descent.

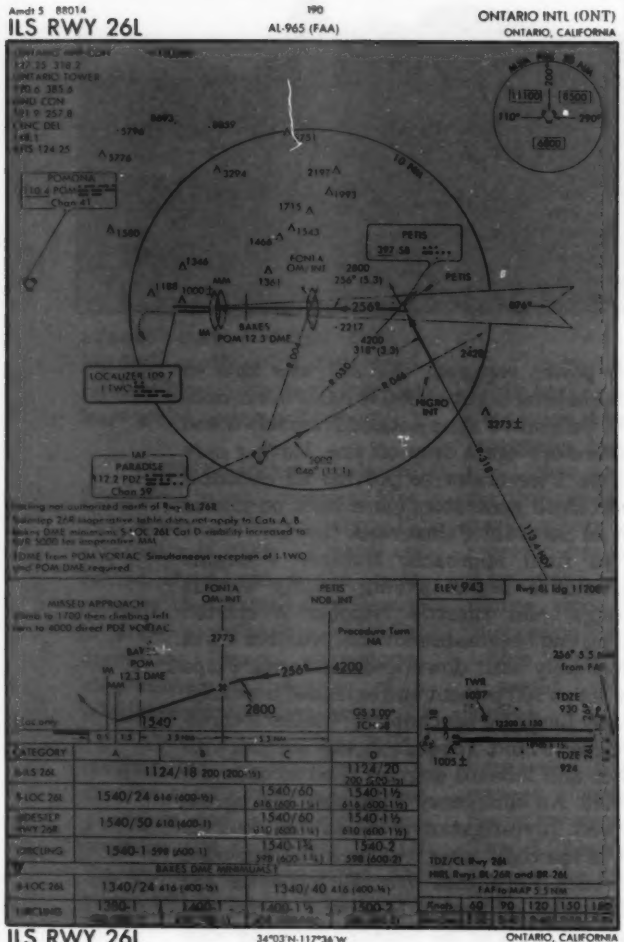
As the crew prepared for an emergency landing, Sergeant Palma noticed two right wing overheat lights illuminate. Major Danny R. Blackburn, copilot, identified the bleed air leak and Major Carper directed isolation of the bleed air system. Sergeant Palma closed the appropriate air valves and normal power returned to all engines. However, the aircraft continued to vibrate severely and Number 3's engine instruments were completely unreliable. With power restored, the AC was able to maintain level flight at 500 ft AGL when, once more, Sergeant Palma noticed Numbers 3 and 4 generators again drop off line, leaving only Number 1 generator to provide all electrical power. Both generators came back on line as soon as Sergeant Palma reset them.

On final approach, Number 4 engine instruments began giving highly erratic readings, and throttle Number 4 started binding and became immovable. Number 4 was immediately shut down and feathered. Flaps were set at 100 percent and extended normally. As they flared for touchdown, Number 3 throttle began to bind. Touchdown was normal, with brakes and inboard engines used to stop the aircraft. An emergency shutdown and egress followed. Investigation revealed the bleed air duct in the right wing root area had exploded with such force that over 40 inches of the leading edge inboard of Number 3 engine had blown out. Part of the remaining leading edge had curled up inside the wing against the throttle cables. Wire bundles leading out to the engines were extensively damaged by the extremely hot bleed air.

Major Carper and crew displayed outstanding professionalism and crew coordination while dealing with an extremely demanding emergency. Their actions have well earned the Excellence in Airmanship Award. Congratulations from *TMF*.

TMF Instrument Quiz

It's just another ILS!



1. Minimum altitude on the procedure track between Paradise VORTAC and Higro intersection is _____.

   a. 4,200 ft
   b. 5,000 ft
   c. 6,800 ft
   d. 8,500 ft

2. Minimum safe altitude at Higro intersection is _____.

   a. 4,200 ft
   b. 5,000 ft
   c. 6,800 ft
   d. 8,500 ft

3. The highest spot elevation depicted on the IAP is _____.

   a. 2,428 ft
   b. 2,197 ft
   c. 3,275 ft
   d. 10,064 ft

4. Glide slope intercept altitude is _____.

   a. 4,200 ft
   b. 2,800 ft
   c. 3,275 ft
   d. 1,540 ft

5. The five approach categories (A through E) are based on 1.3 times the aircraft stall speed in the landing configuration, and uses the aircraft's indicated approach speed.

   a. True.
   b. False.

6. This approach is designed for a threshold crossing height of 58 ft.

   a. True.
   b. False.

7. The mandatory altitude for crossing the final approach fix at Fonta OM during a S-ILS-26L is _____.

   a. 2,800 ft
   b. 2,773 ft
   c. 1,540 ft
   d. None of the above.

8. If you're executing this approach, localizer only, you should maintain no lower than 2,800 ft MSL until crossing Fonta intersection.

a. True.
b. False.

9. If measured ceiling is below 200 ft, you are prohibited from executing the S-ILS-26L, Category C approach.

a. True.
b. False.

10. You are level at 7,000 ft MSL, 14 nm southeast of, and inbound to, Paradise VORTAC when Approach clears you for the straight-in ILS Runway 26 Left approach via Paradise VORTAC. At this point, you may descend to 6,800 ft. (MSA).

a. True.
b. False.

11. Higro intersection is depicted as 11.1 DME from PDZ VORTAC.

a. True.
b. False.

12. You may initiate descent from 2,800 ft at the glide slope intercept point during the S-ILS 26L approach regardless of a full scale deflection on the CDI, as long as you do not descend below 1,540 ft before you receive accurate glide slope indication.

a. True.
b. False.

13. Decision height is determined by the barometric altimeter.

a. True.
b. False.

14. Climbout instructions from approach control supersede published missed approach instructions, and constitute an ATC clearance.

a. True.
b. False.

15. Your approach speed is 135 KIAS. For a localizer only approach, timing to the missed approach point should be about _____.

a. 2:12
b. 2:30
c. 2:45
d. 3:40

16. Localizer only height above touchdown for aircraft capable of simultaneous reception of I-TWO and POM DME is _____.

a. 200 ft
b. 616 ft
c. 416 ft
d. 458 ft

ANSWERS

1. b. 5,000 ft.
2. d. MSA provides a minimum obstruction clearance of 1,000 ft above the highest obstacle within 25 nm from the designated facility. On the particular IAP, watch out for the classic "gotcha!" The base facility is displaced from the aerodrome, and the compass orientation is other than north.
3. d. 10,064 ft.
4. b. 2,800 ft.
5. a. True. Aircraft performance has a direct effect on the airspace and visibility required to perform approach-related maneuvers such as circle to land, timing missed approaches, and on-final alignment corrections for descent and landing. DOD FLIP General Planning, para 9-1b.
6. a. True.
7. d. The 2,773 altitude depicted on the profile view at the FAP is a reference for that point on the glide slope. Technically speaking, there really isn't a final approach fix on an ILS.
8. a. True.
9. b. False. Visibility only is required. In this case, a Cat I capable aircraft must have visibility of ¼ sm or RVR 24 to initiate the approach.
10. b. False. Once cleared for the approach, maintain the last assigned altitude and heading until established on a segment of the published terminal routing or IAP. AFM 51-37, para 10-4c.
11. b. False. While Higro may in fact be 11.1 DME from PDZ, the fact is, ranges published along terminal routings are expressed in nautical miles, not DME. AFM 51-37, para 10-6b.
12. b. False. You may not descend below the glide slope intercept altitude if the CDI indicates a full scale deflection. However, if CDI is within limits but GSI is not, you may proceed at or above 2,800 ft to Fonta intersection and, at that point, initiate descent to the localizer MDA. If the glide slope is captured to within one dot (half scale) *below* the glide slope, or two dots (full scale) above the glide slope, you may resume the ILS approach to decision height.

   CAUTION: The ILS/LOC approach must be discontinued if the localizer course becomes unreliable, or anytime full scale deflection of the CDI occurs on final approach. AFM 51-37, para 13-1b. NOTE: A common and dangerous error when flying an ILS on the flight director is to concentrate on the steering bars and ignore flight path and aircraft performance instruments. Failure of the flight director computer (steering bars) may *NOT* always be accompanied by the appearance of warning flags.
13. a. True. AFM 51-37, para 13-1bb(4).
14. a. True. AFM 51-37 para 13-1.
15. b. 2-27 to 2:30.
16. c. 416 ft.

Flying-Hour Milestones

7,500

23 AF
Lt. Col. Charles E. Baerti
CMSgt. Terrance R. Kelly
MSgt. Richard D. Lorenz

5,000

23 AF
Maj. William F. Fortune
Maj. David G. Roeber

2,500

23 AF
Lt. Col. Christopher D. Mays
Maj. Paul McVickar
Maj. Glenn L. Moody
Maj. Graham G. Williford
Maj. Donnie R. Ellis
Maj. John R. Ozenham
Maj. Ronald E. Dietz
Capt. Kevin S. Kaneshiro
Capt. Stephen P. Childers
SMSgt. Philip R. Baar
MSgt. Wilbert J. Rutz
MSgt. Peter J. Guittari
TSgt. Arnold E. Lamb
SSgt. Johnnie Hoskins

21 TAS
TSgt. Dale D. Polka
TSgt. William D. Roberts
SSgt. Stephen F. Bingel
SSgt. John H. Giegler
SSgt. Scott A. Hathaway
SSgt. Ronald A. Ruhmann
SSgt. David D. Wood
Sgt. Donald R. Schmidt
Sgt. Richard J. Gallo
Sgt. Lofland L. Gregory

75 MAS
Lt. Col. Douglas A. Burnett
Lt. Col. Gregory S. Caron
Lt. Col. Kenneth H. Davis
Lt. Col. Delloyd J. Jacobson
Lt. Col. Dennis W. Keeling
Maj. Charles K. Barton
Maj. William J. Brown
Maj. Richard L. Booker
Maj. Robert R. Davies
Maj. Charles B. Kleiber
Maj. Ronald K. Kobernik
Maj. Louis J. Pohle
Capt. Dale Andrews
Capt. Amy C. Bond
Capt. Dennis L. D'Angelo
Capt. Gary S. Dilda
Capt. Michael J. Karaffa
Capt. Stephen M. Levba
Capt. Joseph R. Luttinger
Capt. Ramona A. Savoie
Capt. Francis W. Sick, Jr.
Capt. William M. Vogel
Capt. Alexander M. Wathen
Capt. Robin R. White
Capt. Keith M. Wilkinson
MSgt. Michael R. Druding
MSgt. Michael K. McNelis
MSgt. Thomas Wiggins
MSgt. James C. Wiley
TSgt. Dennis L. Adams
TSgt. John J. Akers
TSgt. Charles E. Brown
TSgt. Dennis A. Carroll
TSgt. William J. Fern
TSgt. Frank G. Fleming
TSgt. James R. Jones
TSgt. Robert A. Marek
TSgt. William H. Marshall
TSgt. Leonard Mitchell
TSgt. James P. Rost
TSgt. Thomas M. Sadilek
TSgt. Billy G. Wren, Jr.
SSgt. Pat M. Childers
SSgt. Vance E. Hobart
SSgt. Huvar R. Hollis
SSgt. Ronald C. Jones
SSgt. Mark R. Kvintus
SSgt. Gary M. Maguire
SSgt. Stacy L. Rogers
SSgt. Robert S. Russell
Sgt. David M. Williams

17 MAS
Lt. Col. Paul W. Anderson
Lt. Col. Albert A. Barnes
Lt. Col. Robert W. Francis
Lt. Col. David J. Jones
Lt. Col. Richard R. Moody
Lt. Col. Michael W. Wooley
Maj. Michael L. Rogers
Maj. John L. Roetberg
Maj. Charles D. Suggs
Maj. Brian R. Voorhees
Capt. Charles T. Ackland
Capt. Philip J. Barbee
Capt. Robin B. Hefka
Capt. Michael C. Maready
Capt. Joe M. Rebeiser
Capt. Ben F. Young, Jr.
SMSgt. Richard T. Brisson
SMSgt. Robert L. Gilbert
SMSgt. Michael A. Giordano
SMSgt. Donald T. Stoffel
MSgt. Lloyd F. Christopher
MSgt. Russell Durfee
MSgt. Conrad L. Erdmann
MSgt. Albert E. Frosch
MSgt. Wayne B. Kelley
MSgt. Glenn F. Klette
MSgt. James J. Marking
MSgt. Ronnie W. Pauley
MSgt. David R. Shelton
MSgt. Mark A. Smith
MSgt. Richard E. Wallace
TSgt. Zack L. Gary
TSgt. Lenard A. Hall
TSgt. Thomas J. McCrorie
TSgt. Anthony G. Oliver
TSgt. Timothy L. Peyton
TSgt. Ross A. Rickert
TSgt. Frank L. Singleton
TSgt. Howard M. Taylor
TSgt. Kenneth D. Tilley
SSgt. James G. Carman
SSgt. Steven W. Hawkins
SSgt. Charles A. Horton
SSgt. Stephen P. Kiernan
SSgt. Joseph D. Kleva
SSgt. Cecelia D. Lange
SSgt. Gordon A. Macdougall
SSgt. Richard J. McCormick
SSgt. David J. Meyer
SSgt. Robin L. Milner
SSgt. Mark W. Salondaka
SSgt. Kevin J. Schreiner

20 MAS
Lt. Col. Clive G. Monjo
Lt. Col. Robert D. Pennington
Maj. Dwight R. Boggs
Maj. Ronald L. Carpenter
Maj. Edward C. Confer
Maj. Thomas J. Danielson
Maj. James K. George
Maj. Thomas P. Kane
Maj. Dale L. Kortum
Maj. Roy Pence, Jr.
Maj. Robert W. Ticknor
Capt. Michael R. Berteaux
Capt. Jonathan R. Bonds
Capt. Raymond R. Delposo
Capt. Larry R. Frank
Capt. Jeffrey L. Fraser
Capt. Wesley L. Jones
Capt. Robert C. Kane
Capt. Donald Lastig
Capt. Donald D. Martin
Capt. Gerald J. Moran
Capt. Joseph M. Nypaver
Capt. Matthew C. Pinckst

Capt. James D. Raspberry
Capt. Robert D. Stimpson
Capt. Marshall N. Valentino
CMSgt. Melvin O. Hamill
SMSgt. Danny E. Matthews
MSgt. Daniel H. Buebe
MSgt. Danny T. Groover
MSgt. William D. Huffman, Jr.
MSgt. Don C. Myrick
MSgt. Ossy D. Sanders, Jr.
MSgt. William F. Tasker, Jr.
MSgt. Alfonzio Williams
TSgt. Mark K. Bruch
TSgt. James E. Coley
TSgt. Kenneth R. Eagan
TSgt. Warren W. Graf
TSgt. James K. Heiser
TSgt. Alfred J. Lang
TSgt. John S. Luttrell
TSgt. Obrian B. Popham
TSgt. Steven D. Redden
TSgt. Terry L. Staley
TSgt. Donnie W. Watts
TSgt. James C. White, Jr.
SSgt. Richard L. Avre
SSgt. David A. Bennett
SSgt. Michael D. Kilfore
SSgt. Carroll H. Lastinger
SSgt. Craig M. Morris
SSgt. Felix R. Serret
SSgt. Dale E. Simmons
SSgt. Samual E. Taylor
Sgt. Dee Coulter
Sgt. Paul D. Hendrickson
Sgt. Robert M. Rauton, Jr.
Sgt. Michael W. Williams

41 MAS

Col. Donald C. Bash
Lt. Col. Donald H. Ciucci
Lt. Col. Harold M. Edwards, Jr.
Lt. Col. Carl C. Hoge
Lt. Col. James A. Norris
Lt. Col. Terry G. Perkins
Lt. Col. William H. Sheley
Lt. Col. Pryor B. Timmons, Jr.
Maj. Errol S. Aboe
Maj. Vernon P. Bordelon, Jr.
Maj. Lewis W. Briggs
Maj. Ronald O. Earp
Maj. John S. Gunter, Jr.
Maj. Thomas C. Janiese
Maj. Scott W. McLaughlin
Maj. Frank D. Myers
Maj. James L. Richards
Maj. Rodney J. Runyon
Maj. Thomas R. Shapter
Capt. David H. Beseeker
Capt. Vincent A. Damanti
Capt. Kim B. Hershberger
Capt. Larry R. Jones
Capt. Joey R. Jordan
Capt. Paul P. LaFarciola
Capt. Peter L. LaPresto
Capt. Steven L. Lesniewski
Capt. James K. McCullum
Capt. Edwin T. McKibben
Capt. Robert K. Meadows
Capt. Charles F. Oakley
Capt. Byron E. Smith
Capt. Daniel H. Stanton
Capt. Leslie W. Sutton
SMSgt. Gregory M. Bourgault
SMSgt. Robert D. Rieden
MSgt. Joseph I. Bates
MSgt. Chester Collier
MSgt. Cornelius T. Cummings
MSgt. James M. Frank
MSgt. Wayne S. Hatley
MSgt. Ronald E. Newbold
MSgt. Todd S. Pickett
MSgt. Harry R. Potter
MSgt. Michael C. Reynolds
MSgt. Hiram R. Webster
MSgt. Robert H. Wells
MSgt. Steven W. Van Valkenburgh
TSgt. Donald H. Byrge
TSgt. Carl E. Cole
TSgt. William G. Dunn
TSgt. Scott L. Elliott
TSgt. Jerry W. Garvin
TSgt. Paul R. Harris, III.
TSgt. James E. Hart
TSgt. Gary L. Headley
TSgt. Bradley P. Jordan
TSgt. David McElveen
TSgt. Edward C. Overstreet, III.
TSgt. Richard D. Rogers
TSgt. Edwin A. Tufts, II.
TSgt. Garrie L. Vass
TSgt. Barron L. Wilkins
SSgt. Gary L. Headley
SSgt. Phillip W. Horne
SSgt. Lance H. Johnson
SSgt. Daniel Kinsman
SSgt. Ken G. Mackey
SSgt. Dennis A. Proctor
SSgt. Dennis K. Raffield
SSgt. George C. Schmitt
SSgt. Robert G. Spaulding, Jr.
SSgt. David C. Sykes
Sgt. Karen L. Blake
Sgt. Allen W. Myers
Sgt. Barron L. Wilkins

76 MAS

Col. David M. Marcrander
Col. Randall R. Mathis
Col. William G. Peconen
Lt. Col. John F. Atkinson
Lt. Col. Ward D. Beightol
Lt. Col. Ronald E. Daniel
Lt. Col. James A. Masserano
Lt. Col. Ronald R. Rotzko
Lt. Col. Bobby M. Stone
Lt. Col. James B. Tapp, Jr.
Maj. Bradley A. Bellacicco
Maj. Douglas N. Cain
Maj. Andrew W. Dunn
Maj. Joseph L. Fox
Maj. Thomas H. Larned
Maj. David L. South
Maj. William R. Toombs
Capt. Kevin M. Cannon
Capt. Robin L. Collins
Capt. Timothy J. Gallagher
Capt. Kenneth A. Gaylor
Capt. John P. Hall, Jr.
Capt. Michael C. Jackson
Capt. Edward E. Kirkham
Capt. Paul T. Randall
Capt. Gary W. Scroggins
Capt. George G. Seaman
CMSgt. Paul J. Harvell
SMSgt. Michael E. Hendrick
MSgt. Ronald E. Bogard
MSgt. Robert W. Chance
MSgt. James R. Culbreth
MSgt. Gail L. Harrel
MSgt. Raymond E. Hinton
MSgt. Benjamin F. Howell
MSgt. Colin B. Jenkins
MSgt. Marcus A. Jenkins
MSgt. William M. Jones, Jr.
MSgt. Cliff Pinckney
MSgt. Roy S. Robertson
MSgt. Glenn R. Wariuft
MSgt. Howard L. Wayland
MSgt. William D. Wilson
TSgt. Frank W. Adkins
TSgt. Horace S. Busbee
TSgt. Robert D. Campbell
TSgt. George R. Craw
TSgt. Patrick R. Farley
TSgt. William A. Fielders
TSgt. James P. Furst, Jr.
TSgt. Gary E. Graves
TSgt. Carl E. Hjort, Jr.
TSgt. Walter M. Hodges
TSgt. Francis J. Lovell
TSgt. Marion D. Reimers
TSgt. Gail A. Rickert
TSgt. Alan B. Robbins
TSgt. Kim R. Retroff
TSgt. George L. Truett
TSgt. Bernard R. Williams
SSgt. Benjamin E. Alexander
SSgt. David C. Allen
SSgt. Mary L. Barker
SSgt. James L. Foy
SSgt. Russel C. Gould
SSgt. Richard L. Lippincott
SSgt. William S. Malone
SSgt. Michael D. McCalister
SSgt. Michael M. Merwin
SSgt. James A. Raby
SSgt. Michael J. Reardon
SSgt. Thomas F. Stegall
SSgt. John W. Strickland
SSgt. Fred J. Tocknell
SSgt. David A. Wilson

1,000

23 AF

Maj. John Blume
Maj. Lee Meader
Maj. Donald Quinn
Capt. Raymond Baker
Capt. Michael Bieniewicz
Capt. Carl R. Binford
Capt. Marshall Bitler
Capt. David Blackburn
Capt. Lance Bodine
Capt. John Chorniga
Capt. Chris Clocka
Capt. Gregory J. Cochran
Capt. David Cribb
Capt. Robert J. Culhane
Capt. Scott Cummings
Capt. Marvin J. Depres
Capt. Darrel Dyer
Capt. Dawn Eiland
Capt. Neil R. Elton
Capt. Marcelo Emeric
Capt. Dean Flanders
Capt. John Gniewkowski
Capt. John T. Goode
Capt. Martin Haley
Capt. William Hansel
Capt. Gerald C. Headley, III.
Capt. Richard Herr
Capt. Mark Hershman
Capt. George Howland
Capt. David House
Capt. Steven W. Kelly
Capt. Keith Kolakofski
Capt. Michael V. Kraut
Capt. Carol Kribbeide
Capt. Normand C. Lagasse
Capt. Thomas Lee
Capt. Dale Leuschen
Capt. Jon A. Matz
Capt. Harold L. Maxwell
Capt. Greg Morford
Capt. Scott Morgan
Capt. Raymond R. Moschler
Capt. James Moulton
Capt. Dan Rose
Capt. Edward Sauvageau
Capt. Albert R. Sunday
Capt. Bryan L. Waugh
Capt. Jeffrey Zak
1st. Lt. John Cannafax
1st. Lt. William Cuttrell
1st. Lt. Dan Fitzgerald
1st. Lt. Mark Knefczynski
1st. Lt. Gordon Moore
1st. Lt. Jeffrey Sherwodd
1st. Lt. Keith Sullivan
1st. Lt. Norm Williams
1st. Lt. John Youngs
SMSgt. Malcolm Hassel
SMSgt. Michael L. Wagner
MSgt. Robert L. Lapointe
MSgt. Garry D. Lowry
TSgt. Michael W. Lael
TSgt. Steven R. Thomson
SSgt. Mark E. Cooper
SSgt. Felix R. S. Guc-ong
SSgt. Gary J. Hauptli
SSgt. Terry C. Hendrix
SSgt. Phillip W. Taylor
Sgt. Brett A. Lund
Sgt. Jimmy W. Barker
SrA. Jeffrey D. Fagan

Ranks and units are those at time of award. ☆

Twenty-Second

22d Air Force Command Briefing

The 22d Air Force, with headquarters at Travis Air Force Base, is responsible for operations westward from the Mississippi River across the Pacific to the east coast of Africa.

Within its half of the globe, 22d AF has overall management responsibility for ten major active units including seven airlift wings, an airlift division as well as numerous air reserve components, and a large medical center.

At the 22d Operations Center, controllers track the location of every airplane, its maintenance condition, and the status of its crew and cargo. It's an extensive operation encompassing over 40,000 miles of established and regularly flown air routes throughout the world.

Two specific tasks are key to its overall airlift mission: First is strategic airlift—the movement of personnel and equipment from the continental United States to major overseas locations. Second, tactical airlift—the delivery of troops and supplies from these major overseas bases directly to the objective area.

Now, for a glance at some of the major strategic airlift units and locations under the purview of 22 AF:

In addition to housing Headquarters, 22 AF, the focal point of all western airlift activities, Travis AFB houses the 60th Military Airlift Wing (MAW), the largest airlift wing in the U.S. Air Force.

McChord AFB, near Tacoma, Wash., is another of the three strategic airlift bases located on the west coast—the 62d MAW. Norton AFB in Southern California houses the third principal port on the west coast—the 63d MAW. The 60th, 62d, and 63d are ideally located to support Pacific operations and to interface with the military and industrial source centers of people, supplies, and technology on the west coast. Hickam AFB, Hawaii, because of its strategic location, is also a principal station. It is the home of the 834th Airlift Division (AD). The 834th supervises the operations of all Pacific units, and is responsible for cargo movement, maintenance, and support requirements for MAC operations in the entire Pacific area.

The Republic of Korea receives airlift on a daily basis as part of our commitment to support South Korea against aggression. Each year, MAC airlifters deliver personnel and material for Exercise "Team Spirit," one of the largest training exercises in the world. It involves both South Korean and U.S. forces.

The workhorses of 22 AF are C-141 "Starlifters," based at the three west coast installations, and C-5 "Galaxies," operating from Travis AFB. The C-141 has proved to be the most versatile, economic, and reliable military jet transport ever developed. It's earned the reputation among airmen as the finest aircraft for transporting troops and medium sized equipment this nation has ever possessed. Each C-141 is capable of air-to-air refueling and can be used for airdropping troops and cargo.

In response to a military need for more flexibility and mobility, the Air Force developed the C-5 "Galaxy." This giant of airlift, the free world's largest airplane, can transport nearly any piece of outsized combat equipment used by the Army. With a cargo capacity of over 120 tons, and an aerial refueling capability, the C-5 can operate almost anywhere in the world.

MAC's airlifter "schoolhouses" are all in the 22 AF area of operations. The 443 MAW at Altus AFB, Oklahoma, provides both initial ground and flight aviation training for all MAC C-141 and C-5 aircrews. The 314 TAW at Little Rock AFB, Arkansas, is the training center for all C-130 aircrews.

C-130 units in 22 AF include the 314 TAW at Little Rock AFB, Arkansas, the 463 TAW at Dyess AFB, Texas, the 96 TAS at McChord AFB, Washington, the 374 TAW at Clark AB, Philippines, the 316 TAG at Yokota AB, Japan, and the 616 MAG at Elmendorf AFB, Alaska. In times of military conflict, airlifting supplies right to the front lines is the job of tactical airlift and the C-130 aircraft. The C-130 "Hercules" is capable of providing direct support to even the most remote locations. Noted for its short field takeoff and landing capability, the C-130 is able to operate from rough, unimproved air strips and is the prime transport for airdropping people and equipment into hostile areas. It employs numerous systems and techniques for delivering cargo—airland, standard airdrop, and the very precise Low Altitude Parachute Extraction System which can deliver supplies directly to the drop zone from an altitude of less than 10 feet. Committed to worldwide airlift, most tactical units are situated conveniently near Army units they support—from Arkansas to Korea, Texas to Alaska.

Twenty-second Air Force has three Reserve Associate Strategic Airlift Wings co-located with the three west coast active duty strategic military airlift wings at McChord, Travis and Norton Air Force Bases, as well as fourteen ANG and eight AFRES tactical airlift units from coast to coast actively engaged in training exercises, providing support in natural disasters, and interfacing with units in both Panama and Europe.

The civilian transportation industry also contributes in day-to-day operations. The majority of military personnel moved in the Pacific are handled by commercial airlines under contract to MAC. Under MAC's Civil Reserve Air Fleet program, many carriers can be called to duty in a national emergency.

The Twenty-Second Air Force arena spans from the cold Antarctic continent, into the Orient and the Far East, into the tropics of Malaysia, Singapore, and to Diego Garcia, (a remote tropical island in the Indian Ocean). Whatever the cargo, wherever the destination, whenever it is needed, 22 AF meets airlift demands—quickly and efficiently.

Air Force

Ready and able.

By Maj. Stephens F. McCauley
Associate Editor

In our last issue, we wrapped up the tour of Twenty-First Air Force and its CONUS subordinate wings. Now, it's time to move westward and begin an in-depth study of Twenty-Second Air Force. In the coming months, we'll also be highlighting each of its major CONUS bases and wings.

Let's begin with an overview of Twenty Second Air Force—some interesting territory there, especially for airlifters who want to better appreciate the time/distance capabilities of modern transports. Simply stated, that half of the globe which isn't in 21 AF is 22 AF territory. That means everything west of the Mississippi River, across the Pacific Ocean and into the Far East and Asia (let's throw in Antarctica, too) "belongs" to 22 AF, as far as airlift is concerned.

With such vast distances and diverse environments in their A.O., it goes without saying the command organization responsible for airlift operations maintains a constant focus on flight safety. To gather more information on *how* they approach flight safety challenges, and to learn a little more about their mission, I visited 22 AF Headquarters at Travis AFB, California.

First stop for any new visitor to 22 AF is the command briefing. It begins with, "MAC's primary mission—whether during national emergency or peacetime operations—is to deploy personnel and equipment quickly to any location in the world; employ them as necessary, and help sustain them in their assigned tasks."

With over 330 aircraft and more than 35,000 people assigned, 22 AF certainly does the job, consistently and safely. Although too lengthy to reproduce in its entirety here, excerpts from the command brief are offered on the opposite page to better acquaint those unfamiliar with the range and scope of 22d's mission.

Naturally, you must talk to the people who make 22d "go" to discover *how* they do it. There's certainly no better way to see that big picture than by getting the "view from the top." While at Travis, I was privileged to do just that during a visit with Maj. Gen. Alexander K. Davidson, the Commander of Twenty-Second Air Force.

The general began by pointing out there are many similarities between 22 AF and 21 AF in performing MAC's conventional airlift mission. "The primary difference, of course, is geography. Flying in the Pacific region, the distances are much greater and, accordingly, the leg times are longer. In my opinion, one thing that derives from this is a bit more potential for crew fatigue and with that a greater opportunity for fatigue-related mishaps.

"Also, weather factors are different out here. On the average, I think we enjoy better weather conditions. Of course, that can help you, but in other ways it can actually be a disadvantage. We have a number of locations with periods of very severe weather conditions. Since our people fly in very good weather most of the time, there's a temptation to become a little complacent. So, it takes our crews a little extra effort to stay sharp. That's an aspect in our safety program which gets a lot of consideration. One more unique feature of 22d is the presence of our formal flight training schools. These operations at Altus AFB for the C-5 and C-141, and Little Rock AFB for the C-130, do by their very nature involve some special flight safety considerations and I can assure you we take that responsibility very seriously."

Concerning ongoing safety programs, General Davidson elaborated on an initiative unique to 22 AF: the Commander's Safety Audit program. "I think it's working well for us. The real advantage is that an area of mishap potential receives focus at the unit level, and since the person who certifies the audit is the commander himself, the process has accountability woven into it. The units are able to focus all their expertise on one subject at a time, once a quarter. They take an in-depth look at a specific area, using a multi-discipline approach. We discover whether we are doing things the hard way, which might otherwise be done a lot safer and a lot easier."

Responding to the "bottom line" issue in safety, preventing mishaps, the general said, "I am extremely pleased with our FY 88 performance—we experienced zero Class A mishaps during that period. That's certainly something for everyone to be proud of, and I want the crews and all of our support troops to know their efforts are much appreciated."

When asked about missions unique to 22 AF, General Davidson elaborated on one of these, the Antarctic midwinter airdrop mission. "We operate this mission annually using C-141s supported by SAC tankers. Using Christchurch, New Zealand, as the jump off point, equipment and supplies are airdropped to the large U.S.

Twenty-Second

22d Air Force Command Briefing

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McChord AFB, near Tacoma, Wash., is another of the three strategic airlift bases located on the west coast—the 62d MAW. Norton AFB in Southern California houses the third principal port on the west coast—the 63d MAW. The 60th, 62d, and 63d are ideally located to support Pacific operations and to interface with the military and industrial source centers of people, supplies, and technology on the west coast. Hickam AFB, Hawaii, because of its strategic location, is also a principal station. It is the home of the 834th Airlift Division (AD). The 834th supervises the operations of all Pacific units, and is responsible for cargo movement, maintenance, and support requirements for MAC operations in the entire Pacific area.

The Republic of Korea receives airlift on a daily basis as part of our commitment to support South Korea against aggression. Each year, MAC airlifters deliver personnel and material for Exercise "Team Spirit," one of the largest training exercises in the world. It involves both South Korean and U.S. forces.

The workhorses of 22 AF are C-141 "Starlifters," based at the three west coast installations, and C-5 "Galaxies," operating from Travis AFB. The C-141 has proved to be the most versatile, economic, and reliable military jet transport ever developed. It's earned the reputation among airmen as the finest aircraft for transporting troops and medium sized equipment this nation has ever possessed. Each C-141 is capable of air-to-air refueling and can be used for airdropping troops and cargo.

In response to a military need for more flexibility and mobility, the Air Force developed the C-5 "Galaxy." This giant of airlift, the free world's largest airplane, can transport nearly any piece of outsized combat equipment used by the Army. With a cargo capacity of over 120 tons, and an aerial refueling capability, the C-5 can operate almost anywhere in the world.

MAC's airlifter "schoolhouses" are all in the 22 AF area of operations. The 443 MAW at Altus AFB, Oklahoma, provides both initial ground and flight aviation training for all MAC C-141 and C-5 aircrews. The 314 TAW at Little Rock AFB, Arkansas, is the training center for all C-130 aircrews.

C-130 units in 22 AF include the 314 TAW at Little Rock AFB, Arkansas, the 463 TAW at Dyess AFB, Texas, the 36 TAS at McChord AFB, Washington, the 374 TAW at Clark AB, Philippines, the 316 TAG at Yokota AB, Japan, and the 616 MAG at Elmendorf AFB, Alaska. In times of military conflict, airlifting supplies right to the front lines is the job of tactical airlift and the C-130 aircraft. The C-130 "Hercules" is capable of providing direct support to even the most remote locations. Noted for its short field takeoff and landing capability, the C-130 is able to operate from rough, unimproved air strips and is the prime transport for airdropping people and equipment into hostile areas. It employs numerous systems and techniques for delivering cargo—airland, standard airdrop, and the very precise Low Altitude Parachute Extraction System which can deliver supplies directly to the drop zone from an altitude of less than 10 feet. Committed to worldwide airlift, most tactical units are situated conveniently near Army units they support—from Arkansas to Korea, Texas to Alaska.

Twenty-second Air Force has three Reserve Associate Strategic Airlift Wings co-located with the three west coast active duty strategic military airlift wings at McChord, Travis and Norton Air Force Bases, as well as fourteen ANG and eight AFRES tactical airlift units from coast to coast actively engaged in training exercises, providing support in natural disasters, and interfacing with units in both Panama and Europe.

The civilian transportation industry also contributes in day-to-day operations. The majority of military personnel moved in the Pacific are handled by commercial airlines under contract to MAC. Under MAC's Civil Reserve Air Fleet program, many carriers can be called to duty in a national emergency.

The Twenty-Second Air Force arena spans from the cold Antarctic continent, into the Orient and the Far East, into the tropics of Malaysia, Singapore, and to Diego Garcia, (a remote tropical island in the Indian Ocean). Whatever the cargo, wherever the destination, whenever it is needed, 22 AF meets airlift demands—quickly and efficiently.

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Ready and able.

By Maj. Stephens F. McCauley
Associate Editor

In our last issue, we wrapped up the tour of Twenty-First Air Force and its CONUS subordinate wings. Now, it's time to move westward and begin an in-depth study of Twenty-Second Air Force. In the coming months, we'll also be highlighting each of its major CONUS bases and wings.

Let's begin with an overview of Twenty Second Air Force—some interesting territory there, especially for airlifters who want to better appreciate the time/distance capabilities of modern transports. Simply stated, that half of the globe which isn't in 21 AF is 22 AF territory. That means everything west of the Mississippi River, across the Pacific Ocean and into the Far East and Asia (let's throw in Antarctica, too) "belongs" to 22 AF, as far as airlift is concerned.

With such vast distances and diverse environments in their A.O., it goes without saying the command organization responsible for airlift operations maintains a constant focus on flight safety. To gather more information on *how* they approach flight safety challenges, and to learn a little more about their mission, I visited 22 AF Headquarters at Travis AFB, California.

First stop for any new visitor to 22 AF is the command briefing. It begins with, "MAC's primary mission—whether during national emergency or peacetime operations—is to deploy personnel and equipment quickly to any location in the world; employ them as necessary, and help sustain them in their assigned tasks."

With over 330 aircraft and more than 35,000 people assigned, 22 AF certainly does the job, consistently and safely. Although too lengthy to reproduce in its entirety here, excerpts from the command brief are offered on the opposite page to better acquaint those unfamiliar with the range and scope of 22d's mission.

Naturally, you must talk to the people who make 22d "go" to discover *how* they do it. There's certainly no better way to see that big picture than by getting the "view from the top." While at Travis, I was privileged to do just that during a visit with Maj. Gen. Alexander K. Davidson, the Commander of Twenty-Second Air Force.

The general began by pointing out there are many similarities between 22 AF and 21 AF in performing MAC's conventional airlift mission. "The primary difference, of course, is geography. Flying in the Pacific region, the distances are much greater and, accordingly, the leg times are longer. In my opinion, one thing that derives from this is a bit more potential for crew fatigue and with that a greater opportunity for fatigue-related mishaps.

"Also, weather factors are different out here. On the average, I think we enjoy better weather conditions. Of course, that can help you, but in other ways it can actually be a disadvantage. We have a number of locations with periods of very severe weather conditions. Since our people fly in very good weather most of the time, there's a temptation to become a little complacent. So, it takes our crews a little extra effort to stay sharp. That's an aspect in our safety program which gets a lot of consideration. One more unique feature of 22d is the presence of our formal flight training schools. These operations at Altus AFB for the C-5 and C-141, and Little Rock AFB for the C-130, do by their very nature involve some special flight safety considerations and I can assure you we take that responsibility very seriously."

Concerning ongoing safety programs, General Davidson elaborated on an initiative unique to 22 AF: the Commander's Safety Audit program. "I think it's working well for us. The real advantage is that an area of mishap potential receives focus at the unit level, and since the person who certifies the audit is the commander himself, the process has accountability woven into it. The units are able to focus all their expertise on one subject at a time, once a quarter. They take an in-depth look at a specific area, using a multi-discipline approach. We discover whether we are doing things the hard way, which might otherwise be done a lot safer and a lot easier."

Responding to the "bottom line" issue in safety, preventing mishaps, the general said, "I am extremely pleased with our FY 88 performance—we experienced zero Class A mishaps during that period. That's certainly something for everyone to be proud of, and I want the crews and all of our support troops to know their efforts are much appreciated."

When asked about missions unique to 22 AF, General Davidson elaborated on one of these, the Antarctic midwinter airdrop mission. "We operate this mission annually using C-141s supported by SAC tankers. Using Christchurch, New Zealand, as the jump off point, equipment and supplies are airdropped to the large U.S.

operating base at McMurdo. We also airdrop at the South Pole itself. Of course, it's extremely cold and perpetually dark down there this time of year, and there are plenty of hazards due to unusual geographic features. For example, the drop altitude at South Pole Station is over 10,500 ft (surface elevation is 9,300-ft plus) and the typical ambient temperature is in the minus 90—100 degree (F) range.

"Another unique mission is performed by our Alaska unit, the 616 MAG at Elmendorf. They're a small unit but they operate their C-130s in one of the most demanding environments in the entire U.S. Air Force. Besides severe and hazardous weather conditions, their mission is complicated by some very challenging approaches to airfields with no go-around options and some awesome visual illusions. They do a tremendous job and have a very good record."

On the subject of new missions and initiatives in 22 AF, the general confirmed CAT (Combat Aircrew Training) is a program which will receive increased emphasis in the coming years. "That'll bring some additional safety considerations, involving a good bit more low level flying than in the past, particularly for the C-5 and C-141. Training of this kind is more realistic and will definitely improve our readiness but it also, by definition, brings on some additional hazards. It puts more strain on the aircrew and aircraft. Regarding the latter, our C-141 fleet is now averaging approximately 30,000 flight hours—the original design life for this aircraft before it was extended coincident with the stretch program. There are plenty of unknowns about what kind of experience we're going to have, fatigue-wise, with the airplane as we accumulate more and more flying hours and increase our low level activity. You can be sure we'll be keeping a close eye on that.

"In a related area, we have another interesting initiative that involves the C-141. For over a year now, we've been working with MAC Headquarters and the Lockheed Company to develop a special briefing focusing on safety considerations, handling qualities and flight characteristics, and aircraft limitations. Hopefully, it will become a road show, eventually getting out to all C-141 units in MAC. We plan to include some things we've learned through RED FLAG and CAT. As we increase our emphasis on more realistic low level training, we felt it might be a good time to visit the field with a team of experts from the Air Force and the builder to brief the troops and answer questions. We're excited about the progress they've made on this effort; I think it will be very useful and well received by our crews."

General Davidson also offered some comments about 22 AF's greatest safety challenge. "I think the biggest safety challenge is instilling safety awareness in all our people. In any military organization, that task is exacerbated by our high turnover rate. Typically, as soon as a commander gets his current organization up to snuff, a little time passes and he has a lot of new people who need to be indoctrinated. We're striving to instill a proper mind set, an attitude, an awareness about safety. It really has to start with me, and percolate down through my subordinate commanders to the aircrews and all the folks who support them.

"Of course, our biggest asset in making this work is our people. That starts with our safety staffs, who do such a great job of passing the word. The bottom line is establishing and maintaining that positive attitude about safety. We want everyone to understand completely and unequivocally that safety is our number one, overriding consideration."

"Down Under."

After thanking General Davidson, I moved along to the office charged with implementing his safety program. On several occasions, I had the pleasure of discussing flight safety issues and concerns with 22 AF Director of Safety, Col. Roger Utley. A couple of fundamental safety precepts summarize his approach to flight safety. "Safety should be a *by-product* of good training and standardization," said the colonel. "That's the goal."

Colonel Utley further elaborated with, "Different missions have different risk factors. Crews need to be aware of that fact. First, they must recognize a potential hazard. Then, they need to keep it in their consciousness. An individual going out on a mission certainly doesn't expect to have an accident, but sometimes mission factors change.

"Crew composition, considering experience levels, is often another factor in running a safe mission. We expect our commanders, ops officers, and schedulers to monitor that pretty closely and selectively schedule crews to ensure a proper experience mix in each crew position. The optimum situation is to put the 'green' crewmember with the 'old head.' *Knowing your people* is certainly the best way to see that a good crew capability mix comes together."

Maj. Kenneth Manring, Chief of Flight Safety, added a couple of additional points. "The diversity in our operating locations, which range from the steamy hot South Pacific to the cold Alaskan frontier, places unusual demands on our crews here in 22 AF. Crews need to be aware of their own limitations when they fly in different environments. Also, unit commander involvement, and cooperation from the units themselves, are the keys to our safety program successes. They're the reason we haven't had a reportable flight mishap in any of the last three TEAM SPIRIT exercises."

Ken introduced me to Lt. Col. Peter Dang, Chief of

An "inside view." 22 AF Operations Center.

22 AF Operations Center. The colonel began by emphasizing, "All command and control centers exist to serve the aircrew, and the command post duty officer is probably the most important person an AC has to interface with in keeping his mission moving in the right direction. They're the 'worker bees' who implement command and control decisions. Aircrews need to empathize with controllers and understand that, especially at NAF level, they're the troubleshooters when mission difficulties arise. Of late, more emphasis is being placed on managing aircrews rather than just managing missions. However, our bottom line slogan remains: We execute the plans, we don't execute the crews!"

While in the Command Center, I spoke with Capt. Mark Stacey of "Route Operations Branch" (that's spelled, "flight planners"). He provided some philosophy with, "We consider ourselves part of the aircrew. On many strat airlift missions, navs aren't actually flying on the plane. However, we are sitting at our nav table right here in this office—still providing our inputs to the crew." Mark introduced me to his boss, Lt. Col. Vasilio Vasiliou. (No, my typewriter didn't stutter. That's Greek for "Bill Williams.") The colonel pointed out that, for flight planners and aircrews, their "big ocean to cross" is the most significant problem in their work. "And Russian airfields are *not* considered acceptable alternates." Both officers asked that I emphasize, "Flight planning isn't really as automated as many crews may think. Although the plans are computer generated, we don't just punch a button and instantaneously get a product. The plan is only as good as the inputs, so we rely on accurate wind information, as well as feedback from the crews. We're more than happy to talk with the aircrews, any time, if they'd just call us!"

Speaking for 22 AF Current Operations, Lt. Col. Michael A. Barber addressed strategic airlift mission itineraries. "The average mission in 22d is gone about 12 days. We use a 'hub and spoke' system, with the hubs recently established at Yokota and Clark. Aircraft are swapped out on a regular basis to help keep mission reliability high. An issue currently on the front burner is scheduling 'quality free time' for crews. We're working to provide individuals with a one month advance plan for a three day period of inviolate time off from duty."

Next, meeting with 22 AF/LG leadership, I had the pleasure of talking with Colonels R.T. Dixon and David Hennesy. They summarized their mission as, "... working to give the crew the *best and safest aircraft* possible. In 22 AF, aircraft spend a week or more in the system. Distances make it more of a challenge to get spare parts and support for them, especially if one breaks at, say, Diego Garcia. Another thing we resource people get very heavily involved with is *mobility* in support of plans. A current project of interest is VOLANT CAPE. We have 16 C-130E aircraft isolated at Little Rock to validate whether we can live out of our WRSK (i.e., Wartime Readiness Spares Kit) for 30 days. Since WRSK was often an 'eyeball guess' in the past, we'll now get to see if our projections are accurate, and we'll also be able to save by eliminating spare parts we may not need in the kit. Eventually, we may get to do this sort of thing with other major weapon systems."

I then met with Col. John Rogers, Chief of 22 AF/DOV. He defined his function with, "Stan /Eval at 22 AF, rather than being 'black hats,' is like a support agency which works to *complement* flight safety." He also pointed out that stan/eval types must now be even more sensitive to the definite decline in aircrew experience levels. "The crews are still very good," said the colonel, "but missions seldom go exactly according to plan."

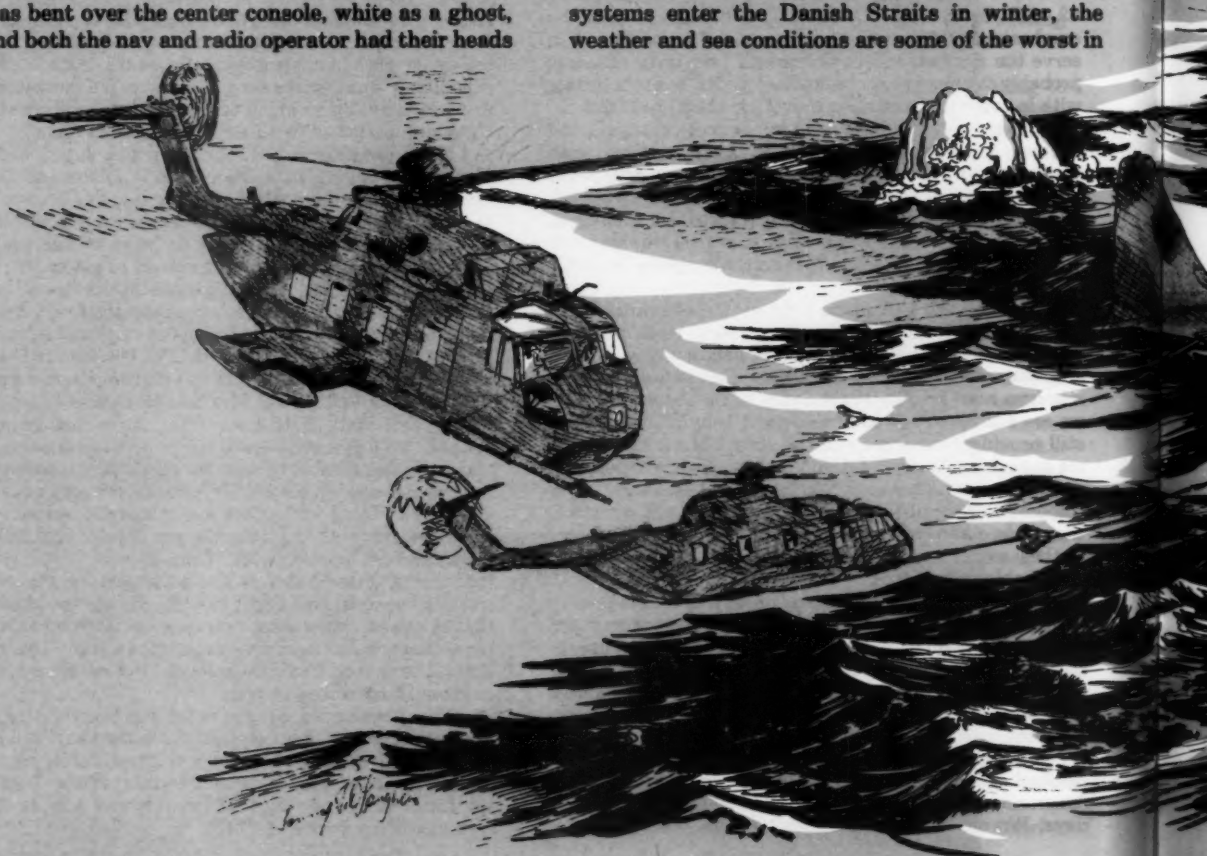
Thus I concluded my tour of Twenty-Second Air Force headquarters. It was certainly worthwhile, and I'm extremely grateful to all the folks at 22 AF Safety for their assistance in helping me assemble this article. Look for specific coverage of each CONUS base and wing in 22d's area in coming issues of *TMF*. ★

A PERSONAL EXPERIENCE

By Maj. Bruce C. Johnston
Hq, Keesler Technical Center (ATC)
Keesler AFB, Mississippi

We'd just cleared Runway 20 at Naval Air Station Keflavik and I'd just set the parking brake on the venerable HC-130, called for the After Landing Checklist, and let out a long sigh. The next thing I heard was a voice in my headset. Keflavik ground was calling: "Air Force Rescue 59826, are you experiencing any difficulties?" The copilot, for some reason, wasn't responding so I answered the call with, "Negative, ground." Ground came back with a simple, "We're getting a little worried, you've been sitting there for almost 30 minutes." It couldn't be . . . I knew we had just landed! I quickly looked around and my worst expectations were confirmed. The copilot was slumped over the yoke, the engineer was bent over the center console, white as a ghost, and both the nav and radio operator had their heads buried in their arms on top of their work tables. There was an eerie silence—they were all dealing with the fact they were alive. Somehow we'd flown 100 miles and landed without really knowing how we got there. We were in a state of shock.

The week had started routinely, just another fun-packed seven-day rescue alert in the land of "Fire and Ice." Everyone was looking forward to a change from those five-hour locals back at RAF Woodbridge, and Keflavik wasn't really all that bad. We knew that not much happens in November in the north Atlantic because our prime customer, the Russian fishing fleet, was headed home for the winter. Anyone familiar with Iceland knows that when low pressure systems enter the Danish Straits in winter, the weather and sea conditions are some of the worst in



the world and only fools risk it for a few fish. I would soon have the opportunity to meet some "people of chance."

We were lounging in the crew quarters enjoying some American TV when that annoying wavering tone sounded from the brick. "RENO 35, RENO 35 . . . SAR in progress . . . report to Rescue Ops ASAP." We reached Ops within minutes and were briefed that a fishing trawler was overdue and presumed lost. As mission commander, I had overall responsibility for coordinating the search effort with all NATO and Icelandic Rescue assets. No big deal, I thought. My crew was good and had an enviable record of saves.

We arrived on scene and worked the areas designated by the navigator, found nothing, and headed home after darkness forced termination. The Jolly was experiencing navigation trouble so we rejoined, took the lead, and flew back to Keflavik at the slow pace of 110 KIAS/55 knots ground speed. At home, the Icelandic Rescue Center requested we continue the search at first light. We agreed to a minimum crew rest with start at one hour before dawn.

Day Two was almost as uneventful as Day One. We abandoned the search because of darkness knowing there wasn't much of a chance of anyone surviving the freezing waters. The ride home was quiet and everyone was tired and disappointed. There is no way I can explain the empty and cheated feeling a crew experiences when they abandon a rescue, empty handed. The crew was drained emotionally and physically, and needed a rest.

Sleep had just settled in when it was abruptly ended with that loud and wavering tone designed to wake the dead. "RENO 35 . . . RENO 35 SAR in progress . . . report to Rescue Ops ASAP." My mind raced, trying to realize what was happening. I must be dreaming. Not now, not again, I thought.

I don't know how, but we launched in record time and were briefed en route to the target. At least we had a target this time. A confirmed position, no endless searching; we had one of those rare opportunities, a second chance. No empty hands this time.

A West German freighter was sinking in 60-ft seas. Weather consisted of snow squalls, freezing ice pellets, wind gusting to 70 mph, and thunderstorms. *Thunderstorms?* Someone joked about the kind of cigarettes the man must have been smoking; thunderstorms in November? Give me a break! The radio operator was receiving reports from the scene. The ship had capsized and the crew of 13 had abandoned ship.

Icelandic fishing vessels had responded to the SOS and, due to heavy seas, were making slow progress. Our two Jollys were now airborne and 20 minutes away from joining the operation. We set out on our task and with the help of everyone, recoveries were adding up. After almost an hour, the group had 11 recoveries with 5 survivors. The helicopters were approaching bingo fuel status and we'd have to stop our search to air refuel. The idea of passing gas at 300 ft above the sea, at night, with lightning in the vicinity, didn't really appeal to us. The crew reminded me that minimum refueling altitude was 1,000 AGL. We knew that would be impossible—with a freezing level of 600 AGL, the HH-3 would fall out of the sky if we hit any ice. The choice was to refuel the helicopters and continue the search or, abandon two people who were possibly still alive. We opted to continue. We were slowly building a box around our options and soon that box would resemble a trash compactor switched to automatic.

Good news from one of the ships—another sailor was recovered, alive! There was still hope for the

remaining sailor. We were confident we had made the right decision.

We completed the first rendezvous, but things slowly started to go wrong. First, the left refueling hose wouldn't extend fully, and then wouldn't retract. We finally got the "stowed and locked" light, but we had lost precious time. So we would have to use the secondary refueling system on the dreaded right side. We broke the news to the Jollys.

The HH-3 is somewhat underpowered, and turbulence generated by the clockwise rotation of the props makes refueling on the right side demanding under ideal conditions, let alone at night in bad weather. It took three attempts, but Jolly 85 plugged in and we topped him off. Jolly 17 called with a sighting, and '85 headed to investigate while we set up for the next refueling. Jolly 17 was only seven minutes to "bingo" and we were now racing to complete the four required checklists and maneuver the tanker into position. The crew briefing consisted of the abbreviated format, "We'll do it just like the last one, any questions?" No one responded to the query.

Our first rejoin was aborted when we ran into a snow storm and "lost visual" procedures were initiated. We broke out of the weather with Jolly two miles at ten o'clock—just where the book said he would be. The nav came over the interphone: "Three minutes to bingo, guys. We better hustle." We made it with seconds to spare but Jolly was having a desperate time getting on the hose. The nav suggested we alter course toward the coast "just in case." We settled on the new course and Jolly tried again, and again, and again. The loadmaster, acting as safety observer, reported each unsuccessful attempt.

The copilot looked at me and we both knew what was coming next. "King 26 . . . Jolly 17 . . . we need asymmetric power . . . it's too rough out here." We reduced power on Number 4 engine to 1,500-inch pounds of torque and reset the rudder trim, knowing full well we were at our minimum operating speed. As the definition ran through my memory the anxiety started to grow . . . "Three to five knots above airframe buffet, with power required to maintain wings level flight." Now we were on the negative side of the power curve. Stall recovery, if required, could be only accomplished by trading altitude for airspeed and we didn't have any to spare. My mind quickly ran back to my UPT instructor telling me that the most useless things to a pilot were altitude above, airspeed in front, and runway behind.

The radio crackled, "Contact—Fuel flowing." The tense silence on the flight deck was broken only by the engineer slowly reporting the fuel transfer "500 . . . 1,000 . . . 1,500 . . . transfer almost complete." The radio operator reported the last crewmember was recovered and a total of six were alive. Then it happened—the box we had put ourselves in was slammed shut.

We had run into a wind shear caused by one of the storms and airspeed was decaying! "King 26 Flight . . . Break Away . . . Break Away." Max power was immediately applied to all engines. The aircraft fishtailed violently, due to the instantaneous power of Number 4 and, now wrong, rudder trim setting. The refueling hose literally jerked from the Jolly resulting in damage to the probe. He was venting fuel and trying desperately to avoid a collision with the tanker's tail.

My radar altimeter was blinking its warning as we passed through 200 ft, still going down. The Jolly pilot had a fist full of collective and was climbing away as we settled toward the stormy seas. It seemed forever, but my VVI reversed and airspeed started to build. I shouted for the engineer to center the rudder trim and for the copilot to back me up on his gauges and call out any deviations immediately. We were now wings level and not descending. Hope was starting to build; we were actually going to make it. The aircraft slowly gained altitude and we leveled at a very comfortable 2,000 feet. We had successfully completed the breakaway/go around and my crew would later jokingly refer to it as the "Surf and Go." A prohibited maneuver.

Back in the crew lounge, the mission complete and survivors safely in the hospital, we debriefed with the help of some liquid refreshment. As we unwound, the questions began surfacing. What had happened? Why did it happen? The excuses started. It was because of the weather; no, it was the long day without crew rest; no, it was because we pushed the mission, first and foremost. Someone shouted, "What do you mean, the mission? What about the motto *'That Others May Live!'* We saved six people tonight." The engineer surveyed the group, waited for silence, and dryly commented, "Yeah, I remember the motto, but next time could we please cut out some of the excitement."

It's been five years since that stormy night and I've, on occasion, reviewed the events and found the decisions were basically sound, though potentially hazardous. But rescue operations are inherently hazardous, and aircraft commanders must evaluate the risk versus the possibility of success. You must work through the situation because every rescue mission will throw you a curve when you least expect it. Bottom line is, *don't put yourself in a situation you can't control,* keep your options open.

Beyond the Freezing Point

Icing—the year-round hazard.

We normally associate cumuliform clouds with hazardous weather, and rightly so, but we have a tendency to also tie the relationship to warmer months, and this can be a dangerous oversight. Although operating aircraft when the freezing level is close to the earth's surface has its good points, among them increased engine performance and drier flight suits, every silver lining has its cloud. In this case it's icing, a devastating phenomenon which can render an aircraft incapable of flight in amazingly short time.

Icing is a cumulative hazard to flight, and that makes its insidious appearance a greater danger. The hazards of icing are numerous: reduction in aircraft efficiency; an increase in stall speed; decreased engine performance; flight instrument interruption; radio communication disruption; and performance degradation of control surfaces, brakes, and landing gear. Basically, ice adversely affects our aircraft through two methods—structural icing affects aerodynamic performance, while induction icing attacks the aircraft power plant's thrust producing ability. Structural icing affects MAC aircraft operations most, and is this article's focus.

STRUCTURAL ICING

It makes sense that, if ice builds up on the exterior of an aircraft, it will affect said aircraft's performance. After all, design engineers spend a lot of time developing a design with just the right balance of weight, strength, and performance. Increased weight added by icing wasn't progged in the Dash One. Likewise, it probably wasn't figured in your weight and balance sheet, either. Another unplanned effect of ice build-up is decreased airfoil lift production. Very carefully calculated to produce the optimum lift for the aircraft mission, an accumulation of ice can reek havoc on an airfoil's lift-producing qualities. In addition, ice build-up on exposed surfaces tends to aggravate drag, with unfortunate results. Rounding out the "aerodynamic big four," structural icing can impact thrust development for propeller driven aircraft. It affects propellers in the same manner as airfoils, only lift produced by propellers is actually thrust. Concerning ice on props, there's an additional hazard. Ice fragments formed on propellers can be slung off, and these projectiles are a source of FOD or structural damage. Even if ejected fragments don't damage the aircraft directly, they may result in an unbalanced propeller—not a healthy situation.

RIME, CLEAR, FROST, OR MIXED?

Icing comes in three forms, each with its own variety and severity of threat to aviation: clear, rime, and frost. Clear ice normally forms

as water droplets accumulate and freeze on surfaces. This is a relatively slow process, which means most air present in the water escapes as the water freezes. This is the reason clear ice is smooth and glassy in appearance. The worst part of clear ice (aside from the aforementioned generic problems) is it's difficult to remove, and that makes it an immediate and continuing problem. Clear ice forms when the temperature is between 0° and -10° Centigrade.

Rime ice formation depends on a prior setup. That is, water droplets must be supercooled (cooled to a free air temperature below the freezing point of water). These supercooled droplets freeze instantly when disturbed, especially on the surface of a passing aircraft. Since they freeze so rapidly, there is no chance for trapped air to escape, which accounts for the rough surface and milky color characteristic of rime ice. Rime ice forms between 0° and -20° Centigrade. Mixed icing, as the name implies, is a combination of the two types. It can occur when the water drops in cumulus clouds are of widely varying size, or when rain intermixes with snow. Mixed icing forms quickly, and has all the adverse characteristics of both rime and clear ice.

Frost forms on earth-based structures, like aircraft sitting on the ramp, when water vapor sublimes to ice and deposits directly on the structure's surface. Even though it may appear thin, a coat of frost will cause a 5 to 10 percent increase in stall speed. Frost reduces airflow over the affected airfoil with a consequent loss of lift.

The following lists reveal some of the effects icing has on aircraft, and some things we can do in response.

EFFECTS OF ICING ON AIRCRAFT

Increased stall speed and power required to achieve or sustain flight.

Resulting surface roughness increases drag, decreasing aircraft performance.

Stall angle of attack will decrease; in some aircraft, stall can occur before stall warning systems activate.

Aircraft stall characteristics can change.

Power available may be decreased.

Trim effectiveness may deteriorate.

Engine FOD or bogdown is likely.

Asymmetric shuddering due to ice shedding from propellers is likely.

Helicopters may experience drastically changed autorotation capabilities.

Control surfaces may freeze in place.

Wing flaps can be damaged in the effort to retract or extend them in icing conditions.

Landing gear mechanism may freeze in place, or be damaged by movement in icing conditions.

Icing can completely block cockpit visibility.

Icing can damage or degrade the effectiveness of communication and navigation equipment.

Icing will exacerbate any other emergency condition.

Icing can create significant error for any instrument dependent upon outside references such as pitot/static or engine pressure ratio measurements.

ICING CHECKLIST

Before takeoff, check weather for takeoff, landing, and enroute icing. If icing exists, ask ATC or weather for any PIREPs they've received.

If you can, plan your route around known icing.

Always remove ice or frost from airfoils before attempting takeoff.

If it's below freezing, avoid taxiing through or taking off over water, mud, slush, or loose ice. If you can't avoid it, make an additional preflight check of flight controls and wheel areas.

Climbing through icing conditions, use a higher airspeed than normal, as icing decreases stall speed.

When deicing equipment begins to lose effectiveness, it's time to change the route of flight or altitude immediately.

Rime icing is usually quite extensive in stratoform clouds, horizontally, so a descent to above freezing temperatures, or a climb to temperatures below -10°C not only may reduce ice build-up, but may avoid the ice region altogether.

Avoid cumuliform clouds if at all possible (a recurrent weather caution, regardless the season).

If you're experiencing icing, avoid abrupt maneuvers, your aircraft isn't the same aerodynamic vehicle it was before the ice.

When landing with ice accumulations, fly your approach with extra power.

File a PIREP as soon as conditions permit—they're the most reliable means forecasters have for identifying icing areas. ✈

FATIGUE— a Common Denominator

In aviation, it all adds up.

By Maj. Stephens F. McCauley
Associate Editor

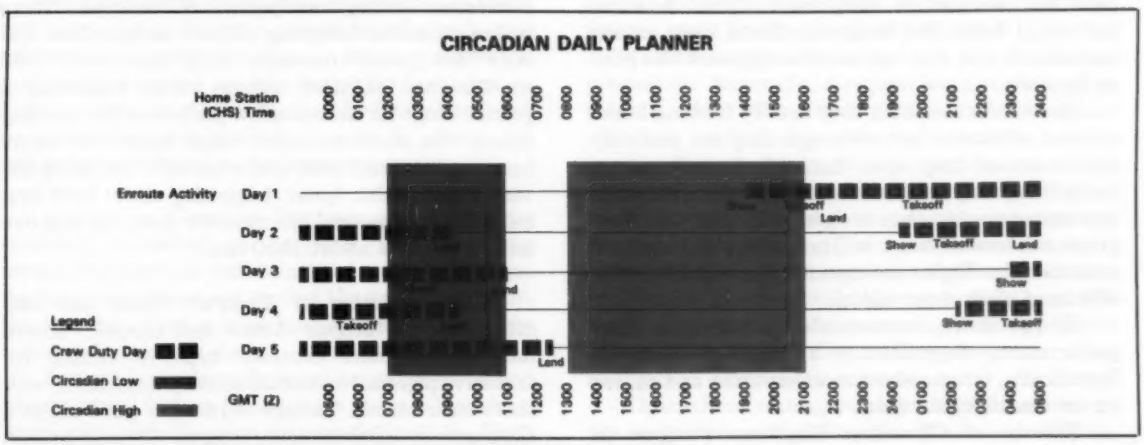
HUMAN FACTORS ANALYSIS: Since the earliest days of aviation, there have been aircraft accidents—now referred to as "flight mishaps". As the first step in the process of reducing the likelihood of mishap recurrence, causes must be identified. Actual aircraft mishaps and near mishaps provide opportunities to study possible causes as safety professionals search out not only *what* happened, but try to focus more on *why* a mishap occurred.

Mishap statistics also offer clues which help identify areas of greater mishap potential. For example, analysis indicates the majority of aircraft mishaps occur during the approach or landing phases of flight. Such evidence certainly justifies greater attention to ensuring optimal crew performance during these stages of flight.

Aircraft Mishap Causes: Federal Aviation Administration (FAA) mishap studies show a common factor: human failing rather than mechanical malfunction is the prevalent cause. Though mishaps may be attributable to design, maintenance, air traffic control, sabotage, or "acts of God," the crew is often a key element. Since aircraft safety design engineers have nearly worked themselves out of a job by resolving machine-caused flight mishap problems, crew-caused types dominate—despite increased priority given cockpit resource management programs. The bottom line question for today surfaces as: "What causes crewmembers to commit errors in judgment, performance, or perception; and, how might the influences of such causes be reduced?" Progress in the field of "Human Factors" (HF) analysis has revealed some solutions while advancing the fundamental goal of flight safety—*mishap prevention*.

This article intends to clarify and summarize the impact of HF studies on mishap prevention and show how aircrew fatigue is often a common denominator among HF elements. Accepted techniques for combating and coping with fatigue are listed to assist aircrews in their lifestyle and daily activity planning for fatigue avoidance.

Human Factors Studies: Pinning down an HF error is a mammoth proposition for any mishap investigation team. Nonetheless, up to 80 percent of all aircraft mishap studies attribute HF as "causal." Recent studies suggest many more mishaps could be blamed on HF if the reason for the "undetermined cause" category of mishaps could be substantiated. So, flight safety professionals continue to look at HF more closely now as they attempt to unravel the



High Fatigue Schedule (hypothetical)

mystery of what causes people to crash perfectly good aircraft.

HF is defined as the study of physical, physiological, psychological, psychosocial, and pathological limitations of man as he interfaces with his environment. Simply stated, HF is a broad discipline which attempts to account for mishap causes not directly attributable to hardware failure. The investigative model used in HF analysis includes the following basic categories: environmental, equipment design, workload, operational, behavioral, and medical. Within the medical category fall the following elements: general health, sensory acuity, drug/alcohol ingestion, and *fatigue*.

Considering the increased attention given HF in mishap investigation, HF must also receive increased emphasis in mishap *prevention*. Aviation professionals are calling for new methods to prevent fixations or distractions which can monopolize the thinking processes of crewmembers who are supposedly trained to avoid such traps. FAA safety specialists acknowledge they cannot make flight rules for every situation and stress that pilots have a moral responsibility to operate in the safest way possible by considering personal limitations, including fatigue.

FATIGUE: By its very nature, aviation is conducive to fatigue. Yet, the effects of fatigue are insidious. Since it cannot be unequivocally measured or defined, fatigue does not have a specific scientific meaning. Being so difficult to quantify, it must normally be self-recognized. Rather than depending upon the amount of work performed, it calls for subjective judgment about how an individual feels. But fatigue's effects vary among individuals, and may not even be apparent to a pilot or his crew.

Some aviators think they can fly for long hours without adequate rest, although they are probably not aware of their own diminished performance levels. They may be able to remain awake under such circumstances, but they are generally more accident-prone and less efficient. Military pilots on long-haul transmeridian flights are especially susceptible to the effects of sleep deprivation.

Thus, it is reasonable to assume that performance degrades as a result of fatigue. Specifically, fatigue slows reaction times and causes errors due to inattention.

Effects of Circadian Rhythms: Fatigue in aviators often occurs because of changes in their "circadian rhythms." Circadian rhythm is a term applied to the body's normal day/night cycle. Body rhythm (circadian) desynchronization has long been acknowledged to have a profound effect on motivation and performance. The exact mechanism of circadians is not fully understood, but the effects are extremely disruptive in terms of how a person "feels" when the normal activity cycle is interrupted.

The daily sleep/wake cycle for most people is longer than 24 hours, usually by 1 to 3 hours. The average cycle is 25.2 hours. Thus, greater fatigue occurs when traveling in an easterly direction than traveling west because the day is "compressed" (west to east flight) as opposed to being "stretched" (east to west flight). Even the most motivated aircrews have fallen victim to that elusive mental mechanism which can temporarily numb the brain at critical times. We know staying at a particular destination long enough eventually permits resetting of the biological clock, or "entrainment," at the rate of about one hour per day (one day for each time zone crossed). Unfortunately, aircrew schedules rarely permit entrainment to occur at en route stops.

As the body tries to adapt to the stress of a circadian shift, sleep not only becomes more difficult, but less restful, and this too induces fatigue. In fact, any attempt to modify regular body rhythms induces fatigue. Long periods of wakefulness cause disorientation along with mental and physical exhaustion. Furthermore, after a period of little or no sleep, it takes two normal rest periods to regain normal alertness levels. Nevertheless, a frustrating fact remains: *A person can't force himself to sleep when he isn't sleepy*.

The FAA acknowledges a lowered alertness level for crews subjected to rapid time zone displacement, or "jet lag," due to traveling in easterly or westerly directions. During these periods of "dullness," there is a measureable lowering of body temperature and such "low points" normally occur from about 0300 to 0500 hrs. Medical opinion varies regarding a precise range for circadian low periods in the morning hours. The most inclusive range spans the hours between 0200 and 0600 hrs, with 0400 hrs being the very lowest point. Later, beginning about 0800 hrs, mental performance and memory seem to improve until a peak at about 1600 hrs.

Characteristics of Fatigue: There are two categories of fatigue: Acute and chronic. Acute fatigue, the more common type, is caused by excessive physical or mental activity associated with short-term stress. Though serious, a good night's sleep usually resolves acute fatigue. Chronic fatigue results from prolonged exposure to stress and causes

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symptoms including insomnia and forgetfulness. Though not as severe as acute fatigue, chronic fatigue is not as easily relieved.

Some of the psychomotor changes associated with fatigue include: disruption of timing and perceptual field of vision; decreased memory, attention span, cooperativeness, and communication skill; increased reaction times, anxiety, irritability, and error rates. Industry research shows fatigue can cause inattention, persistent repetition of ideas, confusion, and anxiety—any of which can degrade cockpit interaction.

Recent FAA analysis shows the three major "fatiguing" factors for crews are number of time zones traveled, multiple layovers in close sequence, and 24-hour layovers after a night arrival. Although any one of these factors can be accommodated by a crewmember during a layover, the presence of two or more begins to strain physiologic recovery. Should all three factors be present during a single mission, fatigue can have a dangerous effect on crew performance. Other "moderate" factors which may contribute to mission fatigue include flight in an easterly direction, multiple transits, day sleep, and missions in excess of seven days. Accumulation of other operational factors (e.g., aircraft malfunctions, air traffic, and meteorologic conditions) also contribute to fatigue. Finally, crew duty day length should be recognized as a significant fatigue cause.

So, even though a pilot may be provided 10 hours rest time, if it is during a period out of synch with reference to his body rhythms, he may not realize the full benefit intended prior to beginning flight duties. Furthermore, his efficiency could be further reduced to dangerously low levels if he must fly during his minimum performance rhythm period.

Fatigue—a Common Denominator: Pilots are routinely expected to perform complex tasks demanding physical well-being and mental alertness. As the most important part of the weapon system, the operator, if not in good health, often becomes the weakest link in the chain.

Fatigue is consistently listed among physical and physiological factors impacting a given HF mishap. Since noise and vibration increase fatigue, the flight environment itself is fatiguing. Because it causes increased inattention, emotional stress also promotes fatigue. Even before a pilot actually feels the first signs of fatigue, "performance decay" and poor judgment become noticeable. Inherent human limitations in monitoring automated systems, further impaired by fatigue or circadian disrhythmia, have led to a number of mishaps or near mishaps. In fact, there have been aircraft mishaps where HF investigation shows the cause was solely or partially due to pilot fatigue.

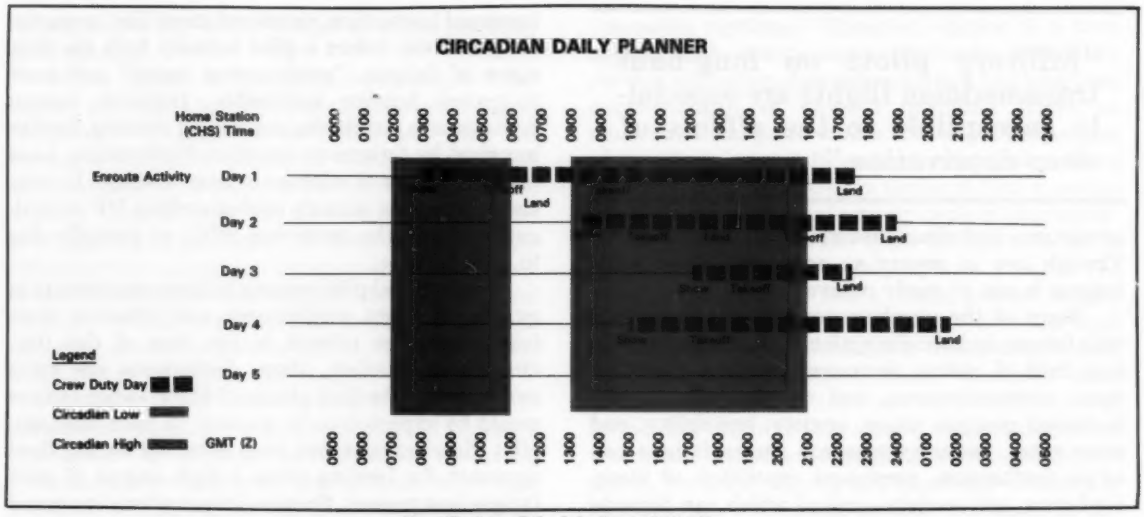
Professional pilot reports indicate decrements in quality of flight performance and effective crew interactions are related to the time of day (i.e., circadians). Further, these decrements are more severe during the final phases of flight—when fatigue would be expected to be greater. In near mishaps, pilot disorientation has even occurred during final approach for landing when a high degree of pilot fatigue was present. Because interruptions in normal sleep patterns are considered the primary cause of fatigue, the importance of disrupted sleep as a causative factor in mishaps may actually be underestimated.

In short, most human factors elements can either lead to, or result from, fatigue. At the very least, fatigue makes aircrews more susceptible to other HF elements. Because fatigue is now commonly acknowledged as a major problem in the cockpit, FAA human factors research workshops have called for more in-depth study into the effects of fatigue on stress and flight deck operations.

Reducing the Effects of Fatigue: The individual crewmember has the greatest influence on his physical well being, and can therefore affect his own resistance and adaptability to fatigue. Since man operates better in daytime than at night, and is geared for regular patterns of rest and activity, fatigue can't be completely eliminated.

Certain routine practices can aid in fatigue prevention. Naturally, a regular work-rest schedule plays a major role. Other factors include regular physical conditioning programs, healthy eating (moderate proportions of high protein/low carbohydrate foods are better than simple sugar foods), and moderation in alcohol consumption and smoking. During flight, drinking plenty of water (about one glass per hour is recommended), as well as stretching and flexing exercises will help ward off fatigue. The FAA also recommends remaining mentally active during long flights by making frequent radio, navigation, and systems checks.

Operational managers play a significant role in the fatigue prevention formula. Without a reminder about physiologic guidelines, suggest commercial



Low Fatigue Schedule (hypothetical)

aviation experts, schedulers may consider the crew as an inanimate component in a system primarily geared towards mission accomplishment. Aviation safety professionals recommend mission schedules which avoid multiple night flights, 24-hour layovers, and multiple time zone crossings whenever possible.

Crews need to know their own physiologic indices for a given flight profile and must judiciously plan their rest periods whenever mission schedules jeopardize optimal work cycles. Finally, the Flight Safety Foundation stresses that pilots who report excessive fatigue should not be punished for refusing to fly.

Conclusion: We've identified fatigue as a likely common denominator in the HF arena. Unfortunately, fatigue is difficult to define or measure, and even more difficult to remedy. How a given crewmember feels, physically and emotionally, is possibly the key element in that crewmember's HF risk profile. While empirical evidence on the significance of fatigue in mishaps may be lacking at present, most safety experts agree fatigue is a factor in many mishaps.

From the information available today, we can derive a couple of fundamental conclusions about fatigue:

a. Stresses associated with HF considerations commonly lead to aircrew fatigue.
b. Aircrew fatigue frequently leads to, or generates, many HF elements which figure so prominently in mishaps.

So, fatigue may either lead to, or result from, stresses considered in the HF arena. Therefore, fatigue may be considered a linking element, or "common denominator," in human factors. This conclusion is particularly relevant for MAC aircrews, since they are exposed to some of the most fatigue-inducing flight duty days in aviation.

The "mindset" orientation of aircrews regarding a given schedule may offer a clue to a rather insidious "fatigue trap." Crewmembers often focus their attention on unrelated mission schedule details, such as time for shopping and amount of free time available, which actually detract from optimal crew rest opportunity. As discussed earlier, the *duration* of crew rest periods is just as important as *timing* of actual rest relative to the individual's circadian rhythm (i.e., his "home station" biological clock).

In-flight periods when critical tasks (i.e., takeoff and landing) must be accomplished deserve much greater focus during schedule development and mission execution. Schedulers and crews should work to align such periods to coincide with hours of peak performance (as suggested by circadian rhythm).

The most fragile element in the flight operations system is the aircrew. Granted, aircrews are a highly adaptive group, but their adaptability has limitations which can lead to catastrophic consequences. Aircrews make mistakes, and a fatigued crew is even more likely to err. Though most aviators and managers are intuitively aware of crewmember fatigue limitations, no structured method for managing the problem currently exists. Thus, it is incumbent upon all MAC operations or support people to make an effort to manage aircrew fatigue at every available opportunity.

Note: Condensed from a research paper submitted to Air War College.

Due to space limitation, the numerous references used to develop this article are not listed here, but are available on request from *TMF*.

QUICKSTOPPERS

A HOIST THAT "HOITS"

Patient onboard USN ship needs medical attention. Medevac helo dispatched. One crewman on deck supervises litter hookup; the other, aboard helo, operates hoist with one hand while controlling hoist cable with the other. As litter approaches bottom of helicopter, rubber switch boot tears from hoist control leaving it running in the "full up" position. Crewman is unable to regain control of hoist switch and the patient's mouth comes in violent contact with the bottom of the hoist boom. Oh my! What started as a relatively minor discomfort resulted in extensive trauma requiring dental surgery. Sometimes the cure is worse than the disease.

DID YOU MEAN TO SAY THAT?

(Editor's Comments) This excerpt from *Callback* illustrates what may happen when one uses incorrect terminology.

". . . After clearing the runway, I (in the right seat) requested tower clearance across the active runway to the opposite side of the field . . . The only word I heard over my headset, which had been functioning properly was 'cleared.' Pilot also heard only 'cleared.'

". . . I glanced to the right and seeing no aircraft the pilot began to taxi across the runway. Once in the middle of the runway, the tower operator screamed at us '. . . clear the runway.' We accelerated across the remaining runway and shortly after, a landing aircraft rolled by . . . .

"I called the tower operator who stated he'd said 'remain clear of the runway.' The only word the pilot and I heard was 'cleared.'

"This potentially drastic situation could have been avoided had standard terminology been used such as '. . . hold short for landing traffic.' The use of the the word 'clear' in a transmission restricting access to an active runway is fraught with disaster if only one word of the transmission is caught, as in this case . . . ."

Ralph Waldo Emerson said it long ago: "It is a luxury to be understood."

How Do I Write Thee?

Let Me Count the Ways

(Editor's comments: The following hints on how to write for *TMF* were printed in a previous edition of the magazine. We thought we'd resurrect them in the hope they'll be as helpful this time as they were in the past.)

Just about anybody who's been flying for a while has experienced, either personally or vicariously, a "war story" type event which is worth passing on to the rest of us who fly for a living. For the person without much writing experience, quite often the biggest stumbling block is deciding how to tell their story in the most interesting and effective way. Try and follow these few tips.

—The most straightforward approach is to simply tell it like it happened in chronological sequence—more or less the same way you'd tell it at a party, including any embellishments, but leaving out names and units to preclude any embarrassement.

—Another technique is to take the basic event and see it as the nucleus for a fictional account. With this method you can manipulate the story line to build suspense, increase drama and impact, invent characters, and exercise considerable imagination in that realm known as creative writing.

—Poetry is another medium for getting your message across which taxes your imagination and permits plenty of creative juices to flow. Just make sure you follow some sort of recognizable rhyme scheme. You may even be inspired to do a parody of a well known song or poem, using your war story as the theme or subject.

There are innumerable tips we could pass on just as there are a lot of good books in the library on how to write, but the above suggestions should be sufficient to get you started. Keep in mind that it's best to stick to subjects you're familiar with as a basis for your entry, even if you're fictionalizing.

Good luck, follow the instructions below, and participate in the 1989 MAC Flight Safety Writing Contest!

THE RULES

The 1989 MAC Flight Safety Writing Contest is conducted according to MACR 900-3 and these rules. Entries must be original, unpublished, *contain an aviation safety/mishap prevention message*, and be postmarked no later than 31 March 1989. Stories must be between 1,000 and 3,000 words long (approximately 6 to 14 double-spaced typed pages). Poetry should average 75 to 100 lines. Manuscripts must be typed, double-spaced, and submitted in two copies. Identify entries by title only and attach a cover sheet indicating author's name, address, duty phone, unit and home address. Please include a brief autobiography.

The contest is open to all. Entries qualifying under the above rules earn their author a complimentary one-year subscription to *TMF*. However, desk sets and plaques may be awarded only to military members and civilian employees of the Department of the Air Force and Air Reserve Components. Other entries may be selected for Honorable Mention in a special category.

Winning entries will be published in *TMF*. Submit to:

MAC Flight Safety Writing Contest
HQ MAC/IGFE
Scott AFB, Illinois 62225-5101

After Deadlines

Wanted. Rated Captain or Major for assignment to HQ MAC staff as an editor for The MAC Flyer. Looking for creativity and desire to further flight safety goals by "spreading the word" through the favorite magazine of airlifters worldwide. For more information on this unique assignment, write to: Supervising Editor, HQ MAC/IGFE, Scott AFB, Illinois, 62225-5101, or call AV 576-3534/5542.

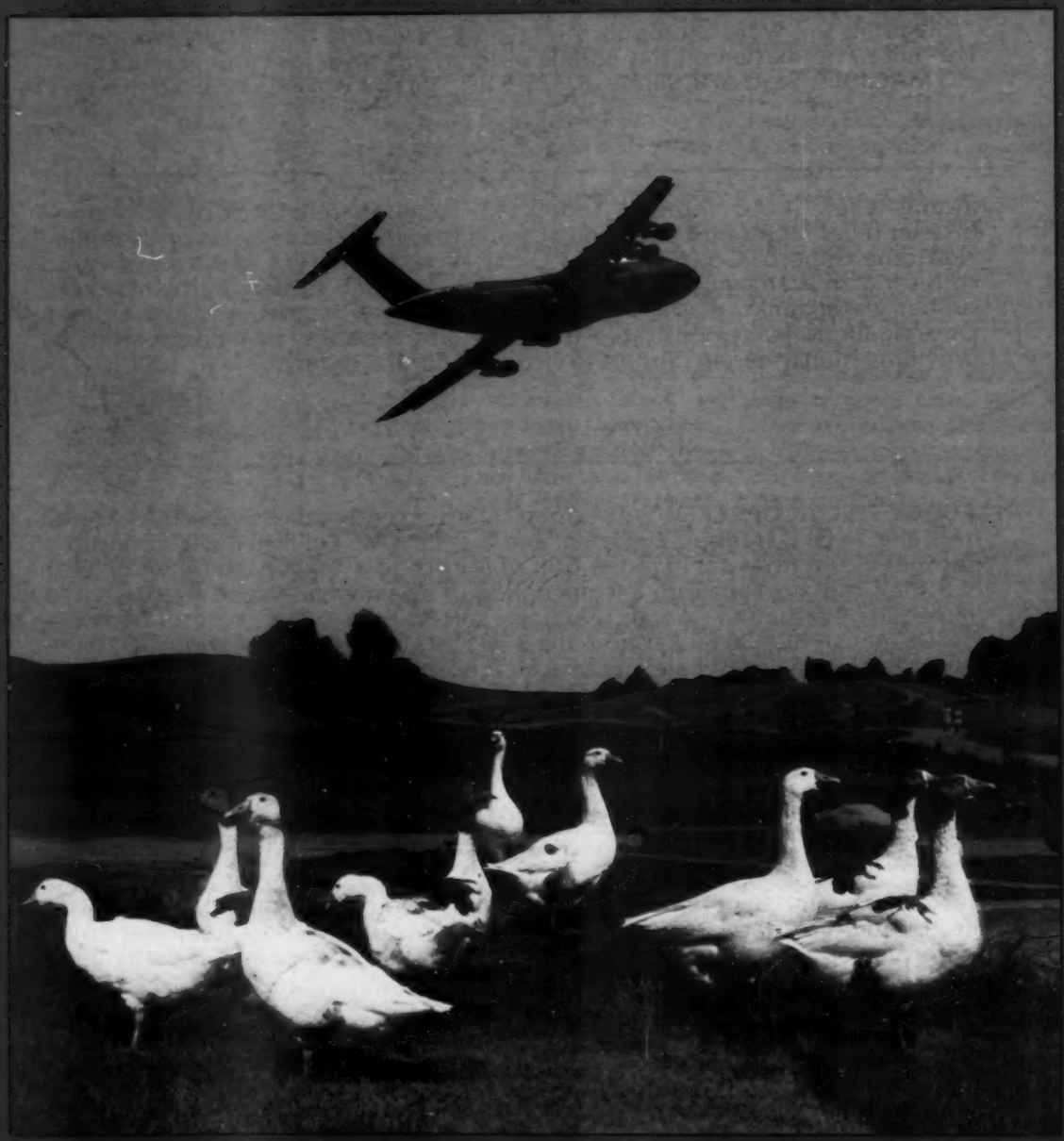
Hurricane Relief. MAC recently supported Jamaican relief efforts with seven disaster relief flights into the island's capital following the devastation caused by Hurricane Gilbert. C-5, C-141, and C-130 aircraft flew tons and tons of cargo consisting of water purification tablets, Meals Ready to Eat, tents, blankets, rubber water tanks, plastic sheeting for temporary shelters, and chain saws. Once again, MAC demonstrated the value and versatility of modern airlift by providing humanitarian support to victims of natural disaster.

RESCUE BY SPECIAL OPS CREW. The Coast Guard recently called upon MAC crews from the 1 SOW, Hurlburt Field, Fla. and the 39 SOW, Eglin AFB, Fla. to airlift a gunshot victim from a ship in the Gulf of Mexico to a Texas hospital. A 38-year old ship's captain, shot with a 9 mm handgun by a member of his crew, needed immediate evacuation. An air-refuelable MH-53 Pave Low helicopter from the 20 SOS and an HC-130 tanker from the 9 SOS located the trawler about 550 miles from their Florida coast bases. From a 60-ft hover above the small boat, and only 10-ft from its masts and antennae, the helicopter lowered a litter for the injured captain. After a two-hour flight to Corpus Christi with their patient, the units involved were credited with a "save."

HH-3 TRAGEDY. On 1 September, an Air National Guard helicopter belonging to the 129th Aerospace Rescue and Recovery Group crashed near Barstow, California. Six airmen were killed in the accident. Our deepest sympathy goes out to the family and friends of those men. *TMF.*

U.S. G P O: 1988-654-015/80012

TOUCH'N GO



"Looks like a real gaggle to me, guys."